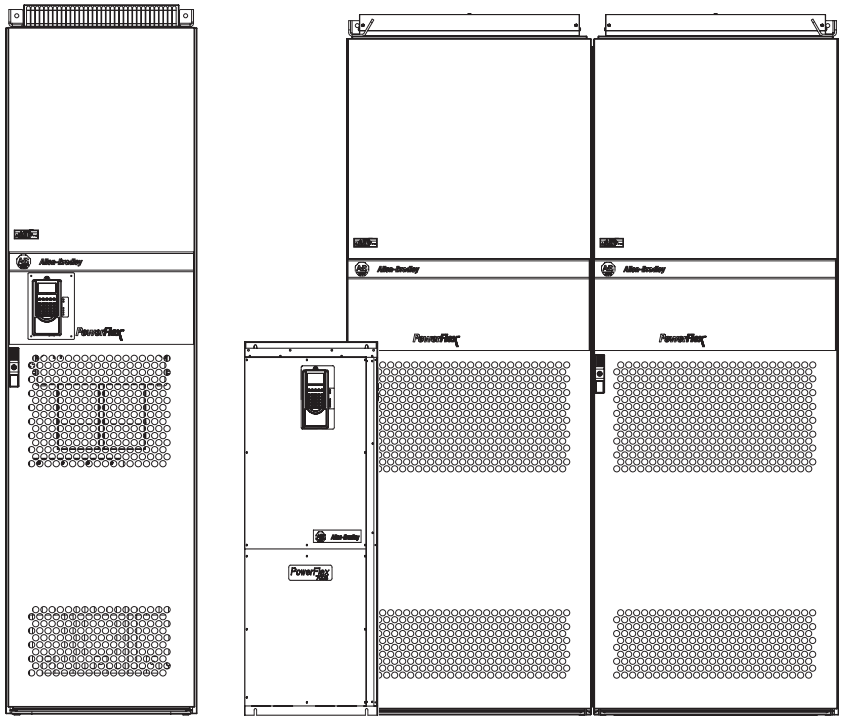
Quick Start

PowerFlex® 700S Drives - Phase II Control (Frame Sizes 9-13)



Introduction

This document is designed to guide you through the basic steps needed to install, start-up, and program PowerFlex 700S AC drives with Phase II Control and frame sizes 9 - 13. **The information provided does not replace the user manual and is intended for qualified personnel only.** For detailed PowerFlex 700S information refer to the appropriate publications:

Title	Publication	Available
User Manual - PowerFlex 700S Drive with Phase II Control	20D-UM006…	www.rockwellautomation.com/literature
Installation Instructions - PowerFlex 700S and 700H High Power Drives	PFLEX-IN006…	
Reference Manual - PowerFlex 700S Drive with Phase II Control	PFLEX-RM003…	
Wiring and Grounding Guidelines for Pulse Width Modulated Drives	DRIVES-IN001…	

Table of Contents

Step 1: Read General Information

Class 1 LED Product

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into module ports or fiber optic cable connectors.

General Precautions

ATTENTION: This drive contains **ESD** (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference Allen-Bradley publication 8000-4.5.2, “Guarding Against Electrostatic Damage” or any other applicable ESD protection handbook.

ATTENTION: An incorrectly applied or installed drive can result in component damage or a reduction in product life. Wiring or application errors such as under sizing the motor, incorrect or inadequate AC supply, or excessive surrounding air temperatures may result in malfunction of the system.

ATTENTION: Only **qualified personnel** familiar with the PowerFlex 700S Drive and associated machinery should plan or implement the installation, start-up and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged completely before servicing. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.

ATTENTION: Risk of injury or equipment damage exists. DPI or SCANport host products must not be directly connected together via 1202 cables. Unpredictable behavior can result if two or more devices are connected in this manner.

ATTENTION: Risk of injury or equipment damage exists. Parameters 365 [Encdr0 Loss Cnfg] - 394 [VoltFdbkLossCnfg] let you determine the action of the drive in response to operating anomalies. Precautions should be taken to ensure that the settings of these parameters do not create hazards of injury or equipment damage

ATTENTION: Risk of injury or equipment damage exists. Parameters 383 [SL CommLoss Data] - 392 [NetLoss DPI Cnfg] let you determine the action of the drive if communications are disrupted. You can set these parameters so the drive continues to run. Precautions should be taken to ensure the settings of these parameters do not create hazards of injury or equipment damage.

ATTENTION: The sheet metal cover and mounting screws on the ASIC Board located on the power structure are energized at (-) DC bus potential high voltage. Risk of electrical shock, injury, or death exists if someone comes in contact with the assembly.

CE Conformity

Conformity with the Low Voltage (LV) Directive and Electromagnetic Compatibility (EMC) Directive has been demonstrated using harmonized European Norm (EN) standards published in the Official Journal of the European Communities. PowerFlex Drives comply with the EN standards listed below when installed according to the *PowerFlex 700S AC Drives with Phase II Control User Manual*, publication 20D-UM006… and the *PowerFlex 700S AC Drives with Phase II Control Reference Manual*, publication PFLEX-RM003….

CE Declarations of Conformity are available online at:
http://www.ab.com/certification/ce/docs.

Low Voltage Directive (73/23/EEC)

- EN50178 Electronic equipment for use in power installations.

EMC Directive (89/336/EEC)

- EN61800-3 Adjustable speed electrical power drive systems Part 3: EMC product standard including specific test methods.

General Notes

- The motor cable should be kept as short as possible in order to avoid electromagnetic emission as well as capacitive currents.
- Use of line filters in ungrounded systems is not recommended.
- PowerFlex drives may cause radio frequency interference if used in a residential or domestic environment. The user is required to take measures to prevent interference, in addition to the essential requirements for CE compliance listed below, if necessary.
- Conformity of the drive with CE EMC requirements does not guarantee an entire machine or installation complies with CE EMC requirements. Many factors can influence total machine/installation compliance.
- PowerFlex drives can generate conducted low frequency disturbances (harmonic emissions) on the AC supply system. More information regarding harmonic emissions can be found in the *PowerFlex Reference Manual*.

Essential Requirements for CE Compliance

Conditions 1-6 listed below **must be** satisfied for PowerFlex drives to meet the requirements of **EN61800-3**.

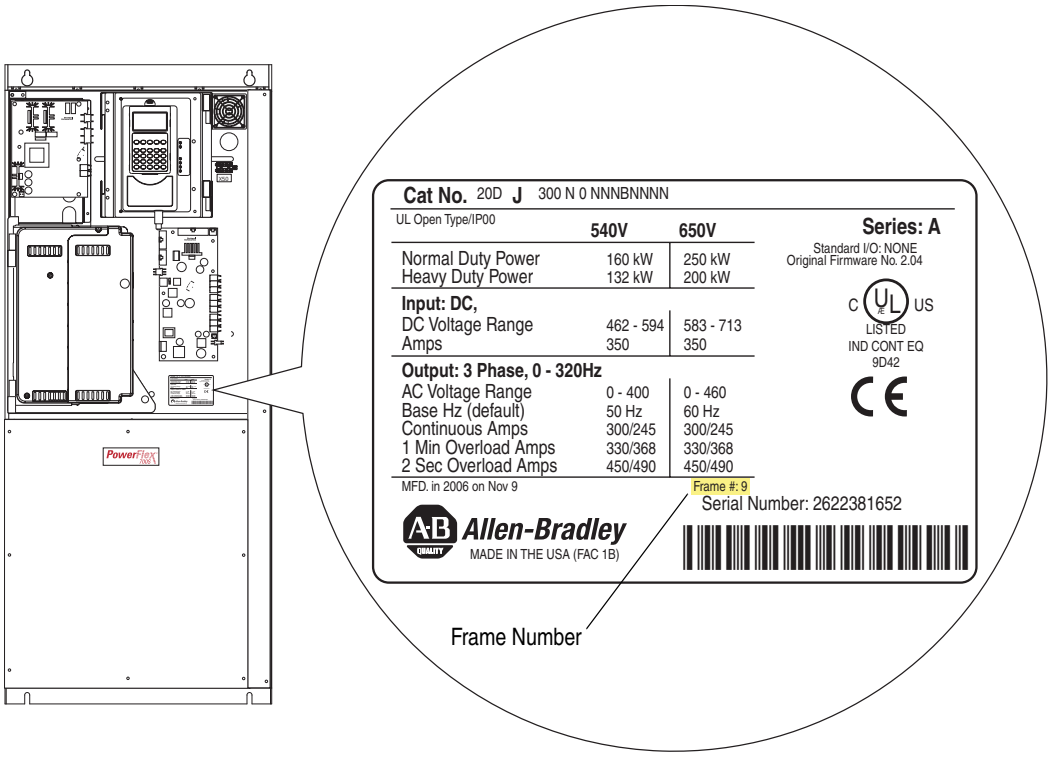
1. Standard PowerFlex High Power CE compatible Drive. For Frame 10, the drive must also be installed in a suitable Rittal TS 8 (or equivalent) enclosure.
2. Review important precautions/attention statements throughout this manual before installing the drive.
3. Grounding as described on page 36.
4. Output power, control (I/O) and signal wiring must be braided, shielded cable with a coverage of 75% or better, metal conduit or equivalent attenuation.
5. All shielded cables should terminate with the proper shielded connector.
6. Conditions in Table A.

Table A PowerFlex High Power EN61800-3 EMC Compatibility

Frame	Second Environment *Restrict Motor Cable to 30 m (98 ft.)* *Any Drive and Option*
9	✔
10	✔
11	✔
12	✔
13	✔

Step 2: Identifying the Frame Size of the Drive

Determine the frame size of your drive by checking the data nameplate on the Control Frame. The frame number is printed just above the serial number.



Step 3: Lifting the Drive

- For lifting instructions for frame 9 size drives, see “Frame 9 Size Drives” below.
- For lifting instructions for frame 10 - 13 size drives, see "Frame 10-13 Size Drives" on page 9.

Frame 9 Size Drives

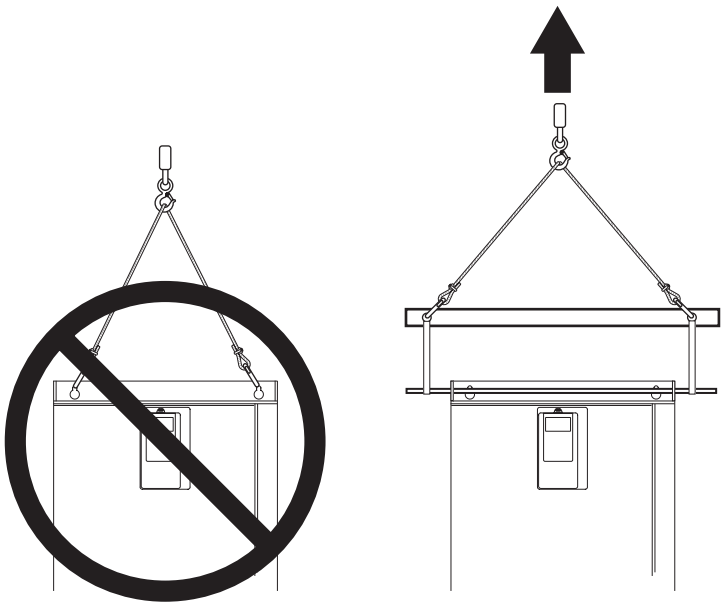
Important: When lifting a frame 9 size drive, a rod must be placed between the lifting holes as shown in Table B.

ATTENTION: To guard against possible personal injury and/or equipment damage...

- Remove any wiring access covers at the top of the drive.
- Do Not allow any part of the drive or lifting mechanism to make contact with electrically charged conductors or components.
- At no time should a person or their limbs be directly underneath the items being lifted.
- Do not subject the load to high rates of acceleration or deceleration.
- Inspect all lifting hardware for proper attachment before lifting drive unit.

Table B Frame 9 - Approximate Drive and Enclosure Weights

Voltage Class	Drive Rating Amps	AC Input Drive & Enclosure Weight kg (lbs.)	AC Input Drive & Packaging Weight kg (lbs.)	DC Input Drive & Enclosure Weight kg (lbs.)	DC Input Drive & Packaging Weight kg (lbs.)
400/480V AC (540/650V DC)	261	143 (315)	143 (315)	109 (240)	109 (240)
400/480V AC (540/650V DC)	300	151 (333)	151 (333)	117 (258)	117 (258)
600/690V AC (810/932V DC)	170	143 (315)	143 (315)	109 (240)	109 (240)
600/690V AC (810/932V DC)	208	143 (315)	143 (315)	109 (240)	109 (240)



Frame 10-13 Size Drives

When lifting frame 10-13 size drives you must:

- attach the lifting hardware.
- remove the skid and shipping feet.

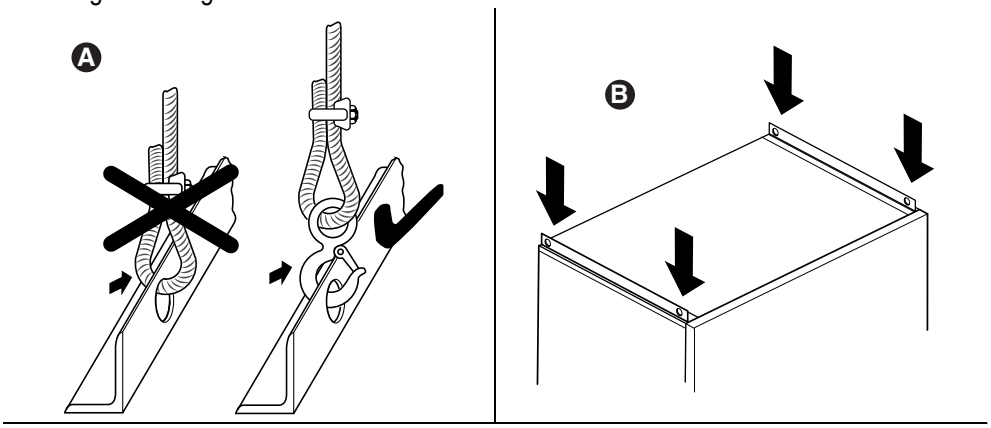
ATTENTION: To guard against possible personal injury and/or equipment damage...

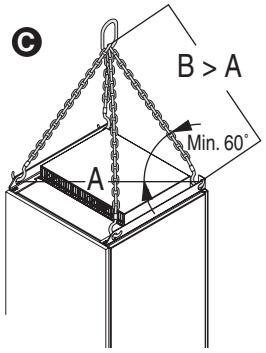
- Do Not allow any part of the drive or lifting mechanism to make contact with electrically charged conductors or components.
- At no time should a person or their limbs be directly underneath the items being lifted.
- Do not subject the load to high rates of acceleration or deceleration.
- Inspect all lifting hardware for proper attachment before lifting drive unit.

Table C Frame 10 - 13 - Approximate Drive and Enclosure Weights

Frame Size	Voltage Class	Drive Rating Amps	AC Input Drive & Enclosure Weight kg (lbs.)	AC Input Drive & Packaging Weight kg (lbs.)	DC Input Drive & Enclosure Weight kg (lbs.)	DC Input Drive & Packaging Weight kg (lbs.)
10	400/480V AC (540/650V DC)	385	382 (842)	432 (952)	267 (589)	317 (699)
		460	382 (842)	432 (952)	267 (589)	317 (699)
		520	382 (842)	432 (952)	267 (589)	317 (699)
	600/690V AC (810/932V DC)	261	320 (705)	370 (816)	267 (589)	317 (699)
		325	351 (774)	401 (884)	267 (589)	317 (699)
		385	351 (774)	401 (884)	267 (589)	317 (699)
		416	351 (774)	401 (884)	267 (589)	317 (699)
11	400/480V AC (540/650V DC)	590	564 (1243)	614 (1354)	396 (873)	446 (983)
		650	564 (1243)	614 (1354)	396 (873)	446 (983)
		730	564 (1243)	614 (1354)	396 (873)	446 (983)
	600/690V AC (810/932V DC)	460	511 (1127)	561 (1237)	396 (873)	446 (983)
		502	511 (1127)	561 (1237)	396 (873)	446 (983)
		590	626 (1380)	676 (1490)	396 (873)	446 (983)
12	400/480V AC (540/650V DC)	820	814 (1795)	864 (1905)	584 (1287)	634 (1398)
		920	814 (1795)	864 (1905)	584 (1287)	634 (1398)
		1030	814 (1795)	864 (1905)	584 (1287)	634 (1398)
	600/690V AC (810/932V DC)	650	752 (1658)	802 (1768)	584 (1287)	634 (1398)
		750	752 (1658)	802 (1768)	584 (1287)	634 (1398)
		820	752 (1658)	802 (1768)	584 (1287)	634 (1398)
13	400/480V AC (540/650V DC)	1150	1348 (2972)	1468 (3236)	600 (1323)	720 (1587)
		1300	1400 (3086)	1520 (3351)	600 (1323)	720 (1587)
		1450	1400 (3086)	1520 (3351)	600 (1323)	720 (1587)
	600/690V AC (810/932V DC)	920	1248 (2751)	1368 (3016)	600 (1323)	720 (1587)
		1030	1248 (2751)	1368 (3016)	600 (1323)	720 (1587)
		1180	1248 (2751)	1368 (3016)	600 (1323)	720 (1587)

Attaching the Lifting Hardware to Frames 10-13 Size Drives





TIP: To ensure that this angle is greater than 60°, make the length of chain or cable between the center and the corners (B) longer than the distance between the opposite corners (A).

Table D Frame 10 - 13 Open Type Drives - Approximate Weights

Frame Size	Drive Voltage Class	Drive Rating Amps	Power Structure(1) Weight kg (lbs.)	AC Choke(2) Weight kg (lbs.)	AC Input Drive & Packaging Weight kg (lbs.)(4)
Frame 10	400	385	120 (265)	115 (254)	235 (519)
		460	120 (265)	115 (254)	235 (519)
		520	120 (265)	115 (254)	235 (519)
	600	261	120 (265)	53 (117)	173 (382)
		325	120 (265)	84 (185)	204 (450)
		385	120 (265)	84 (185)	204 (450)
		416	120 (265)	84 (185)	204 (450)
Frame 11	400	590	210 (463)	84 (185)(3)	378 (833)
		650	210 (463)	84 (185)(3)	378 (833)
		730	210 (463)	84 (185)(3)	378 (833)
	600	460	210 (463)	115 (254)	325 (717)
		502	210 (463)	115 (254)	325 (717)
		590	210 (463)	115 (254)(3)	440 (970)
Frame 12	400	820	120 (265)	115 (254)	350 (772)
		920	120 (265)	115 (254)	350 (772)
		1030	120 (265)	115 (254)	350 (772)
	600	650	120 (265)	84 (185)	288 (635)
		750	120 (265)	84 (185)	288 (635)
		820	120 (265)	84 (185)	288 (635)

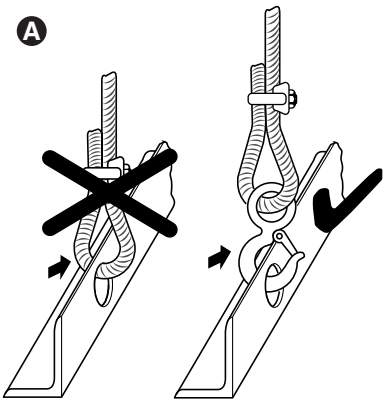
(1) Two power structures are required per Frame 12 Drive
(2) Two reactors are required per Frame 12 AC Drive
(3) Two reactors are required per Frame 11 AC Drive
(4) DC input drive and packaging weight is equal to the weight of the power structure

Frame Size	Drive Voltage Class	Drive Rating Amps	Weight kg (lbs.) AC Choke	Weight kg (lbs.) Power Structure	Weight kg (lbs.) NFE Module
Frame 13	400	1150	130 (287)(1)	306 (675)	67 (148)(1)
		1300	115 (254)(2)	306 (675)	67 (148)(2)
		1450	115 (254)(2)	306 (675)	67 (148)(2)
	600	920	130 (287)(1)	306 (675)	67 (148)(1)
		1030	130 (287)(1)	306 (675)	67 (148)(1)
		1180	130 (287)(1)	306 (675)	67 (148)(1)

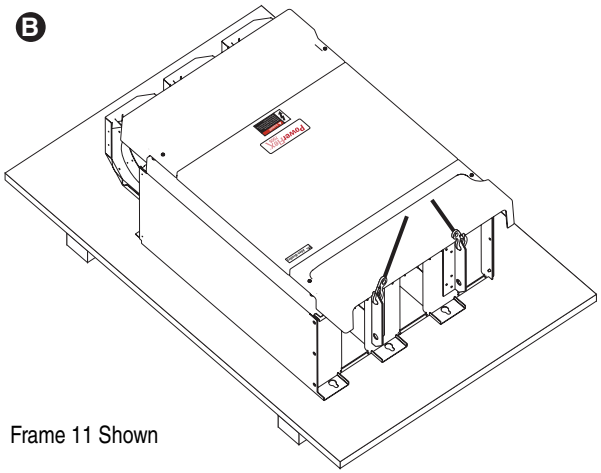
(1) Two reactors and NFE Modules are required per Frame 13 AC Drive
(2) Three reactors and NFE Nodules are required per Frame 13 AC Drive

Directions for Open Type Drives

A

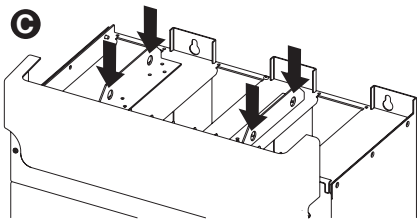


B

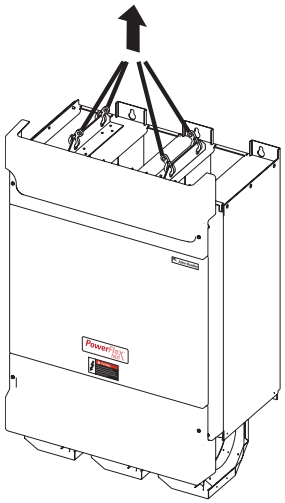


Frame 11 Shown

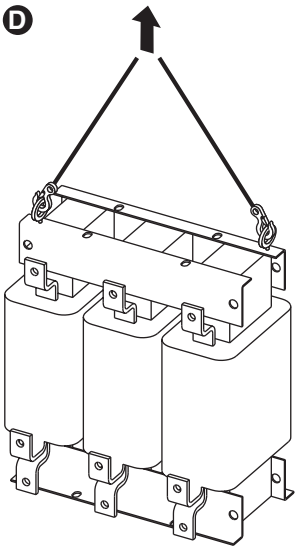
C



Fasten the module symmetrically in at least two (2) holes (Frame 11 shown).



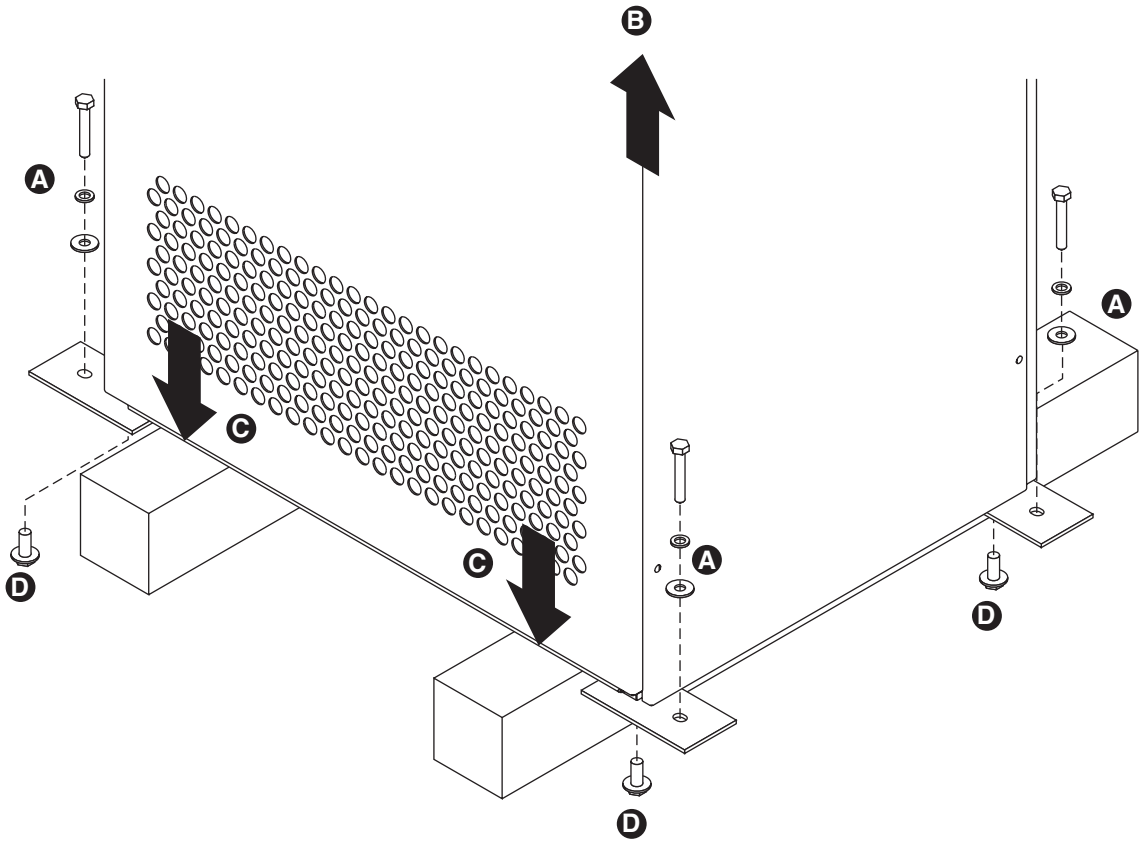
D



Removing the Skid and Shipping Feet

ATTENTION: To guard against personal injury and equipment damage, do not work under the drive unless the drive is securely mounted on appropriate blocks.

Task	Description
A	Using a 15 mm wrench, remove the hardware which secures the drive to the skid.
B	Lift the drive off the skid.
C	Place the drive on proper blocks on a hard, level surface. The blocks should be approximately 10 cm (4 inches) high.
D	Using a 17 mm wrench, remove the hardware which secures the feet to the drive and remove the feet.



Step 4: Mounting the Drive

Operating Temperatures

Frame Size	Required Airflow m^3/h (cfm)	Voltage Class	Amp Rating	Surrounding Air Temperature	
				Normal Duty	Heavy Duty
9	1300 (765)	400	261, 300	0 to 40 degrees C (32 to 104 degrees F)	0 to 40 degrees C (32 to 104 degrees F)
		600	170	0 to 40 degrees C (32 to 104 degrees F)	0 to 40 degrees C (32 to 104 degrees F)
			208	0 to 35 degrees C (32 to 95 degrees F)	0 to 40 degrees C (32 to 104 degrees F)
10	2600 (1530)	400	385, 460, 500	0 to 40 degrees C (32 to 104 degrees F)	0 to 40 degrees C (32 to 104 degrees F)
		600	261, 325, 385	0 to 40 degrees C (32 to 104 degrees F)	0 to 40 degrees C (32 to 104 degrees F)
		600	416	0 to 35 degrees C (32 to 95 degrees F)	0 to 40 degrees C (32 to 104 degrees F)
11	3900 (2295)	400	590, 650, 730	0 to 40 degrees C (32 to 104 degrees F)	0 to 40 degrees C (32 to 104 degrees F)
		600	460, 502	0 to 40 degrees C (32 to 104 degrees F)	0 to 40 degrees C (32 to 104 degrees F)
		600	590	0 to 35 degrees C (32 to 95 degrees F)	0 to 35 degrees C (32 to 95 degrees F)
12	5200 (3060)	400	820, 920	0 to 40 degrees C (32 to 104 degrees F)	0 to 40 degrees C (32 to 104 degrees F)
			1030	0 to 40 degrees C (32 to 104 degrees F)	0 to 35 degrees C (32 to 95 degrees F)
		600	650, 750	0 to 40 degrees C (32 to 104 degrees F)	0 to 40 degrees C (32 to 104 degrees F)
			820	0 to 35 degrees C (32 to 95 degrees F)	0 to 35 degrees C (32 to 95 degrees F)
13	4200 (2472) Inverter Unit	400	1150, 1300, 1450	0 to 40 degrees C (32 to 104 degrees F)	0 to 40 degrees C (32 to 104 degrees F)
		600	920, 1030	0 to 40 degrees C (32 to 104 degrees F)	0 to 40 degrees C (32 to 104 degrees F)
	1150 (677) each Converter Unit	400	1150, 1300, 1450	0 to 40 degrees C (32 to 104 degrees F)	0 to 40 degrees C (32 to 104 degrees F)
		600	1180	0 to 35 degrees C (32 to 95 degrees F)	0 to 35 degrees C (32 to 95 degrees F)

N/A = Not Available at time of printing

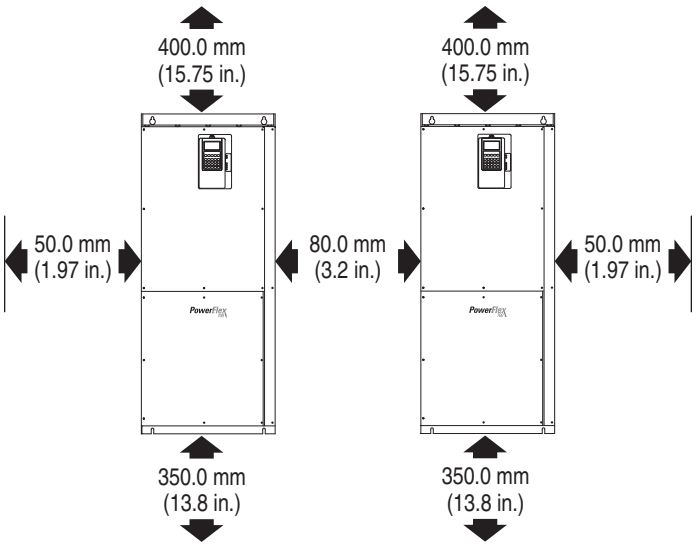
- For minimum mounting clearances for frame 9 size drives, see "Frame 9 Size Drives Mounting Clearances" below.
- For minimum mounting clearances for frame 10 size drives, see page 15.
- For minimum mounting clearances for frame 11 size drives, see page 17.
- For minimum mounting clearances for frame 12 size drives, see page 19.
- For minimum mounting clearances for frame 13 size drives, see page 21.

Also:

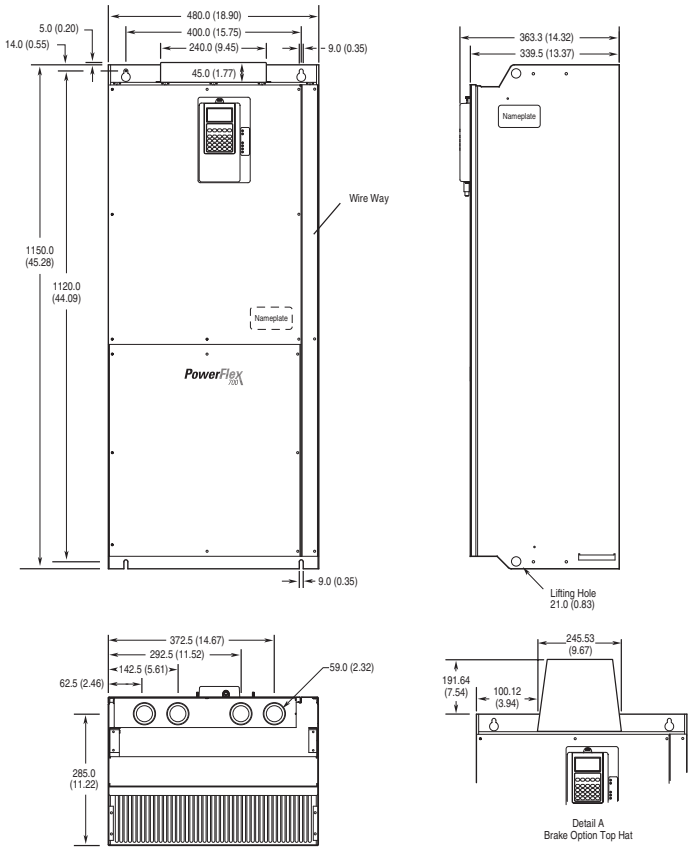
- For floor and wall mounting of frame 10 - 13 size drives, see page 23.

Minimum Mounting Clearances and Dimensions

Frame 9 Size Drives Mounting Clearances

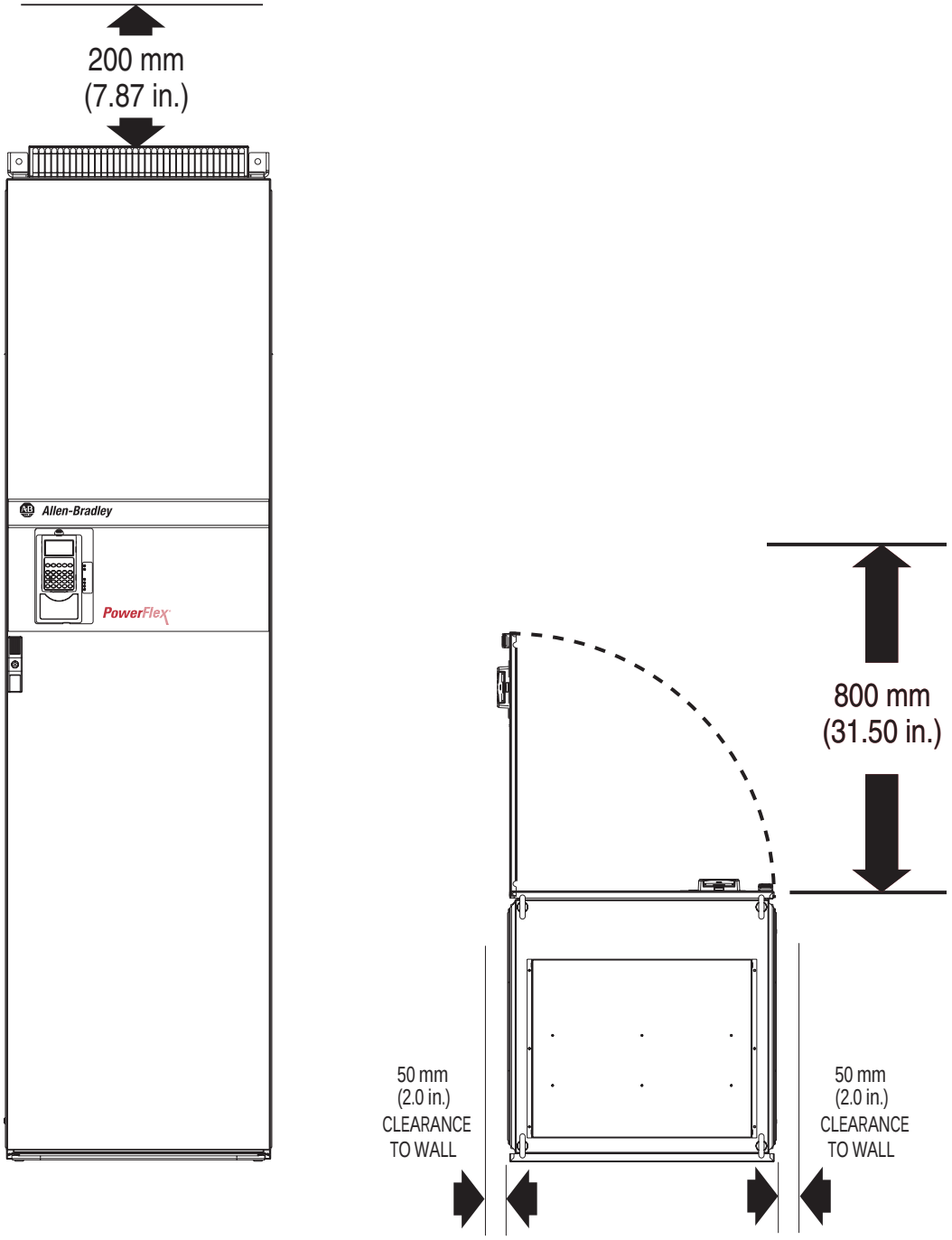


Frame 9 size Drive Dimensions

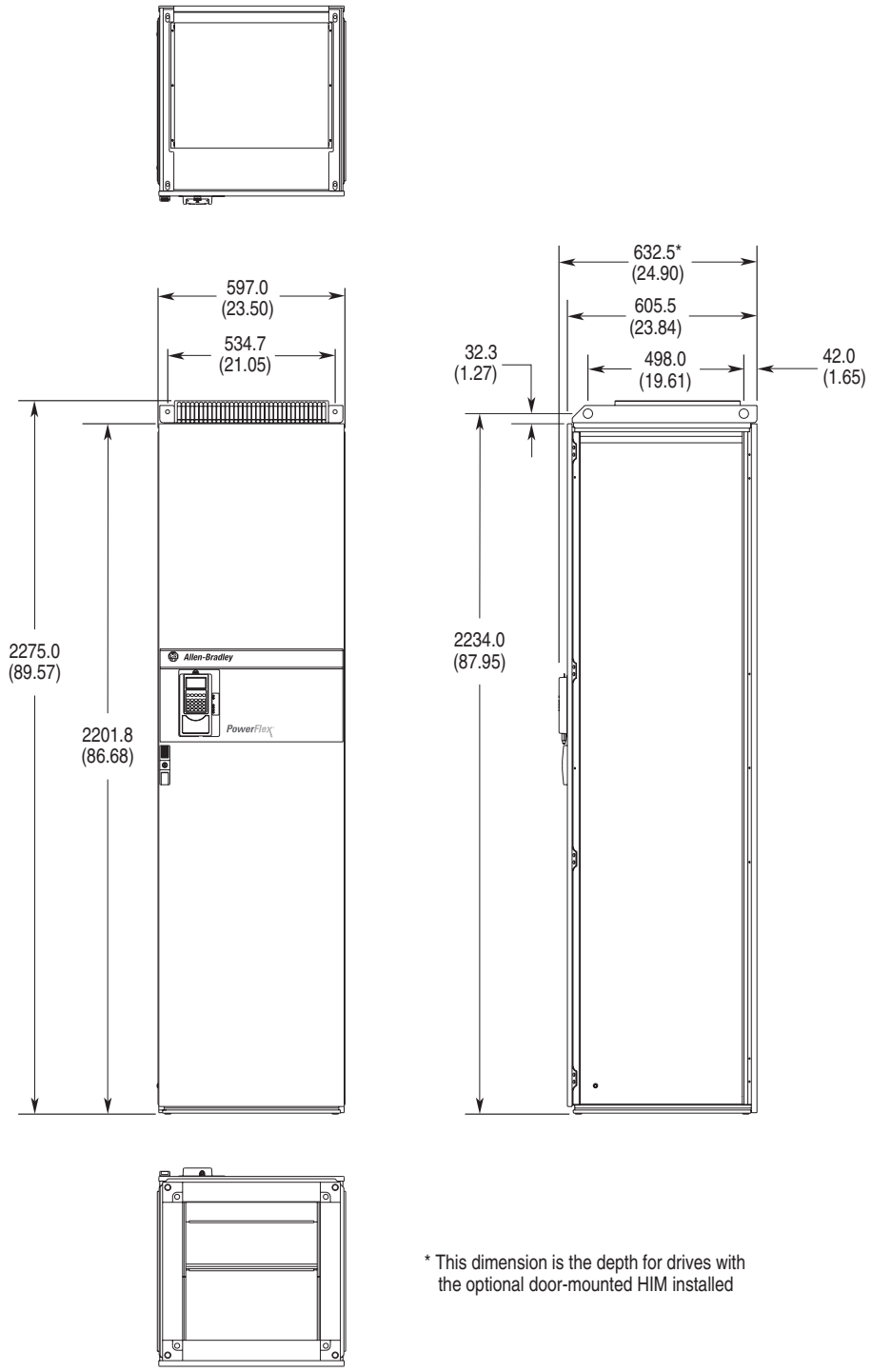


Dimensions are in millimeters and (inches).

Frame 10 Size Drives Mounting Clearances



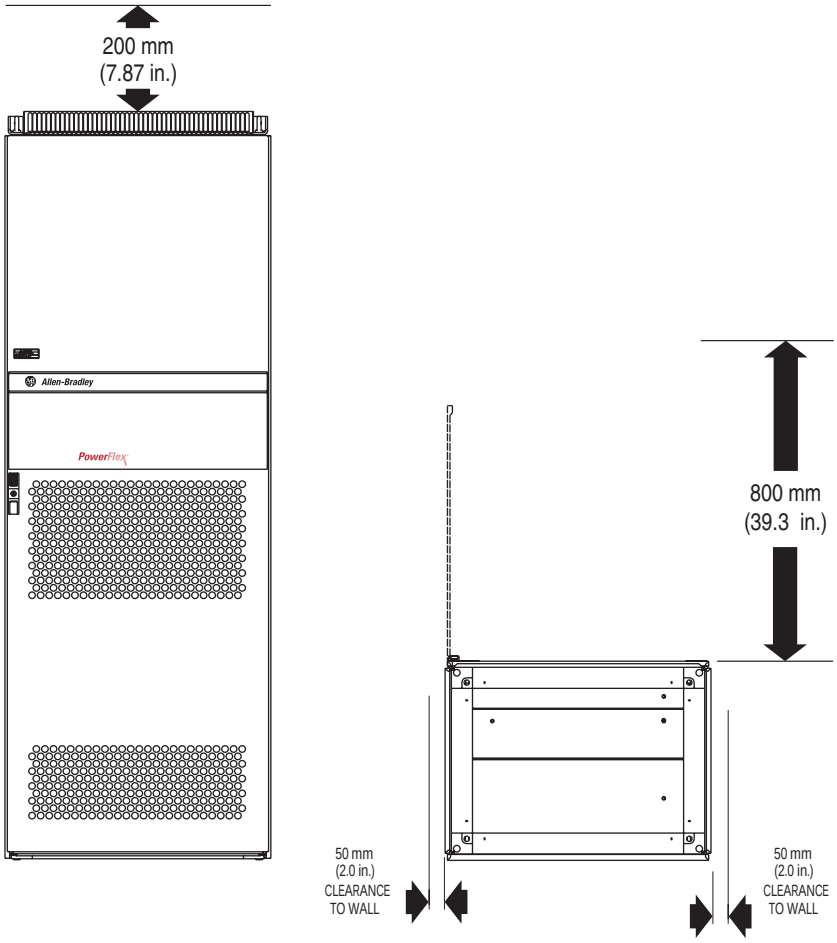
Frame 10 Size Drive Dimensions (NEMA/UL Type 1, IP21 Enclosure Code “A”)



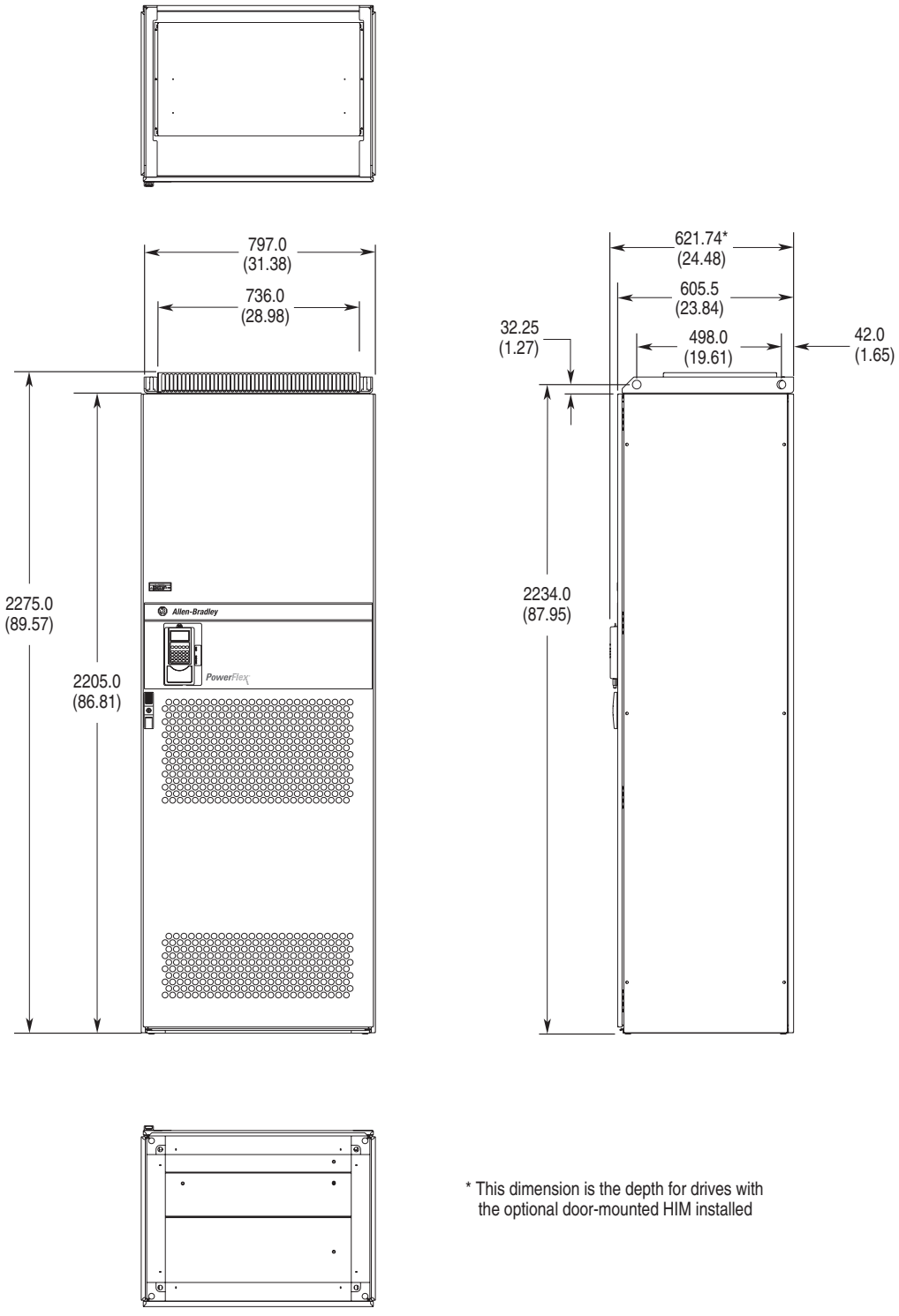
* This dimension is the depth for drives with the optional door-mounted HIM installed

Dimensions are in millimeters and (inches).

Frame 11 Size Drives Mounting Clearances



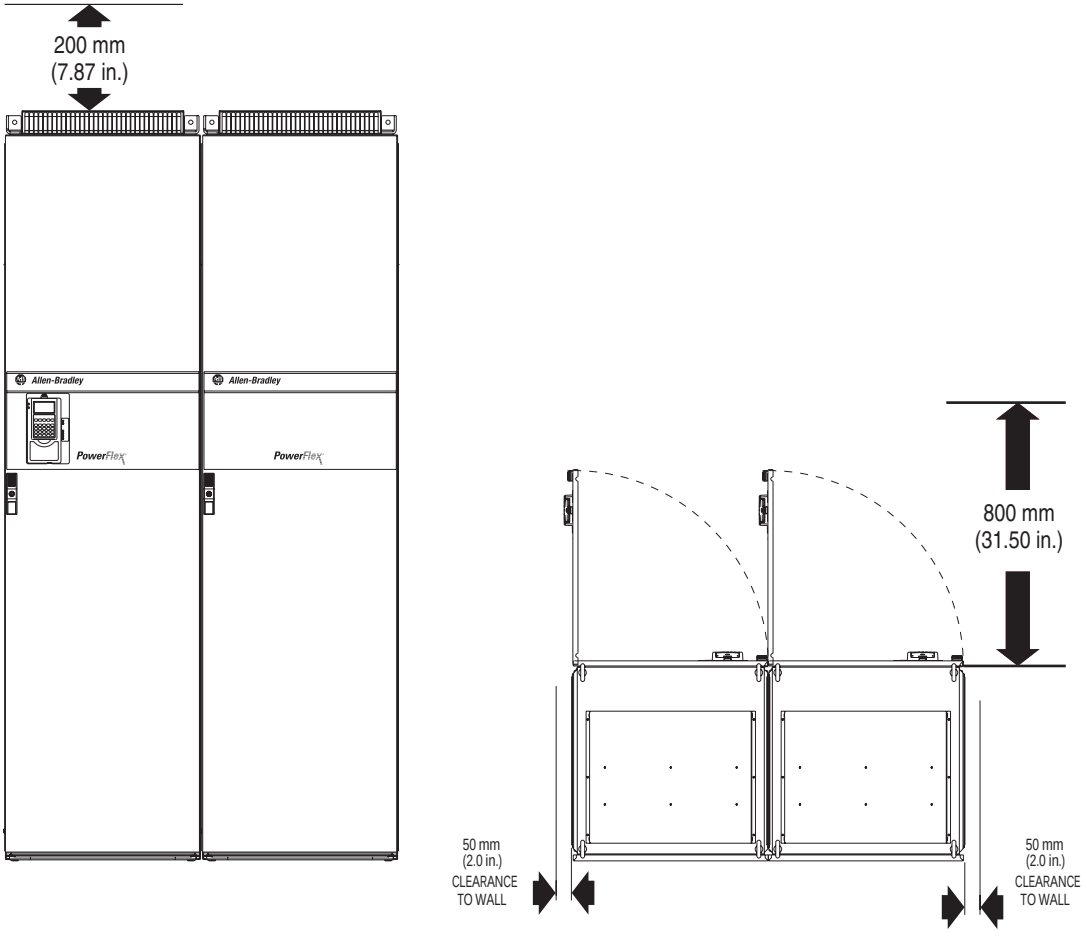
Frame 11 Size Drive Dimensions (NEMA/UL Type 1 - IP21 Enclosure Code “A”)



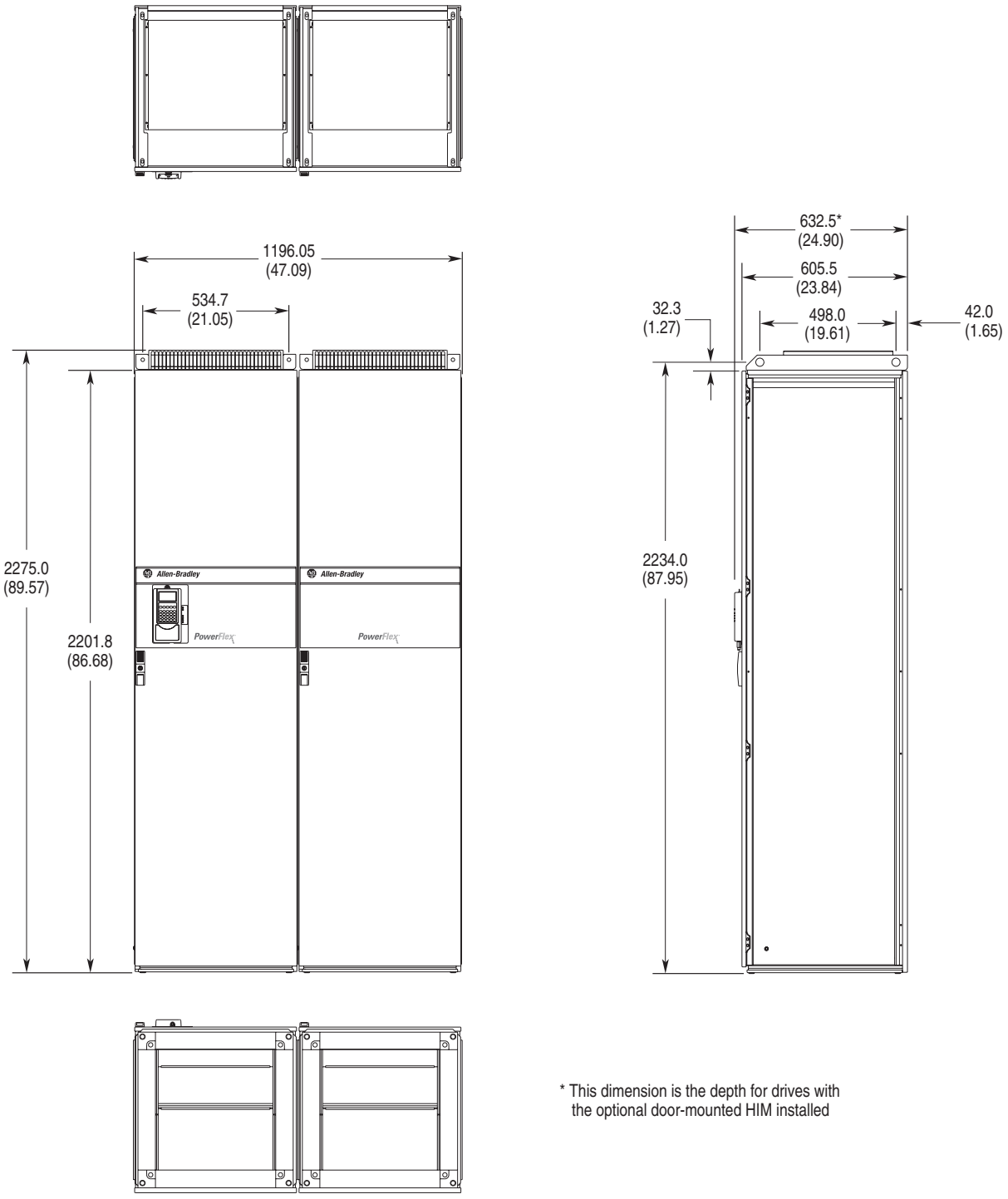
* This dimension is the depth for drives with the optional door-mounted HIM installed

Dimensions are in millimeters and (inches).

Frame 12 Size Drives Mounting Clearances



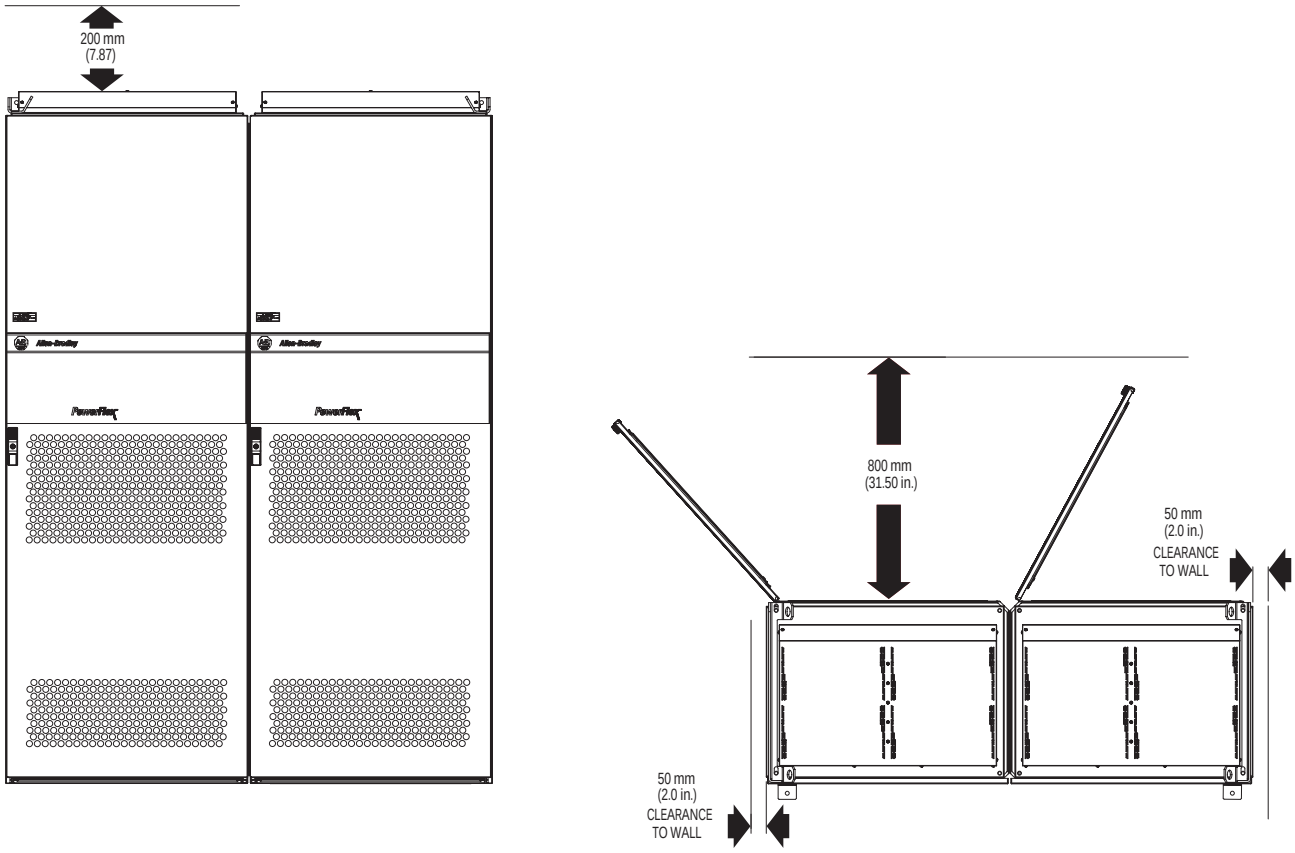
Frame 12 Size Drive Dimensions (NEMA/UL Type 1 - IP12 Enclosure “A”)



* This dimension is the depth for drives with the optional door-mounted HIM installed

Dimensions are in millimeters and (inches).

Frame 13 Size Drive Mounting Clearances

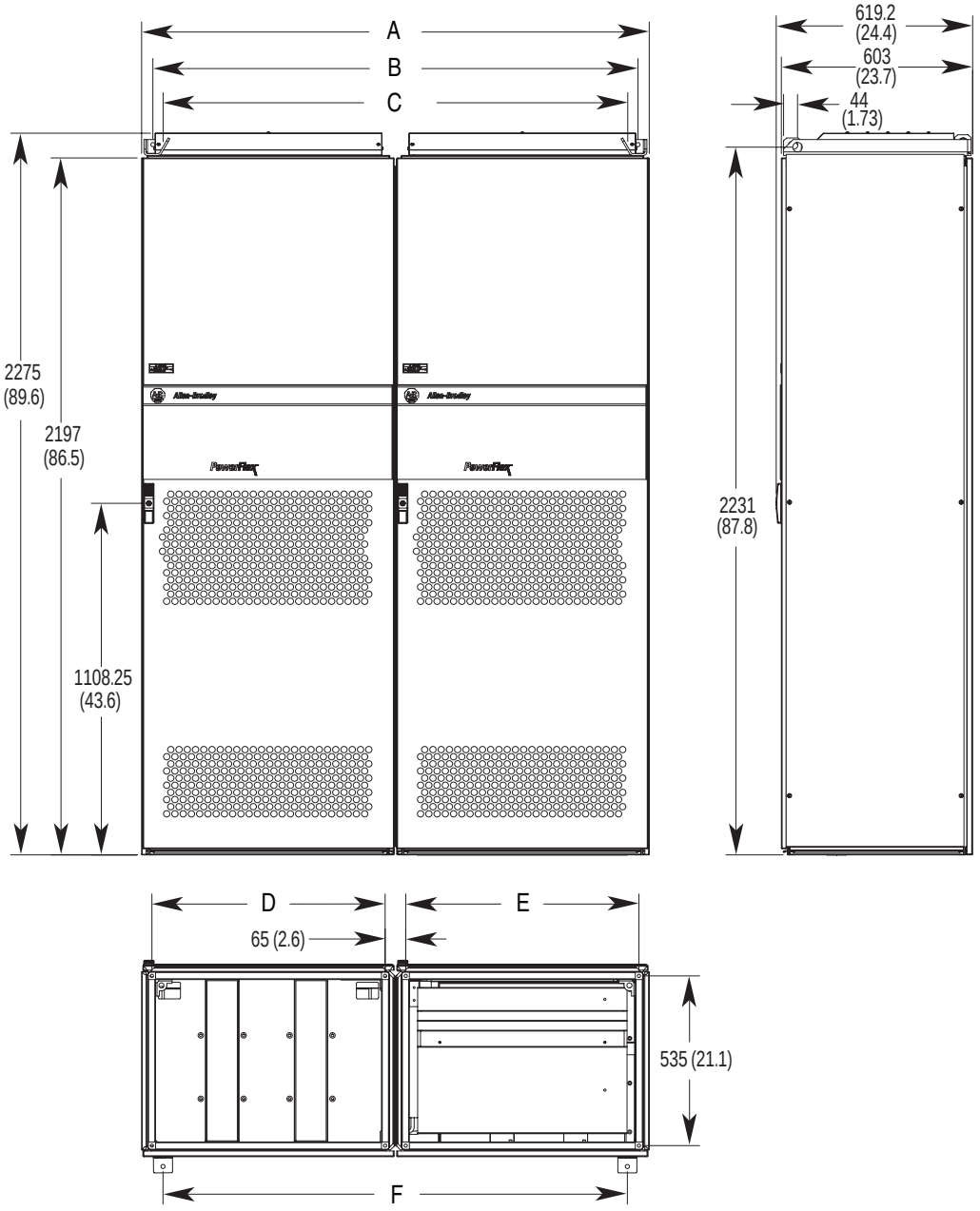


1800 mm Cabinet Shown.

Frame 13 Size Drives - Dimensions

Voltage Class	Amps	A	B	C	D	E	F
400V	1150	1412 (56)	1329 (52)	1264 (50)	535 (21)	735 (29)	1264 (50)
	1300	1600 (63)	1529 (60)	1464 (58)	735 (29)	735 (29)	1464 (58)
	1450						
600V	920	1412 (56)	1329 (52)	1264 (50)	535 (21)	735 (29)	1264 (50)
	1030						
	1180						

Dimensions are in mm and (in.)

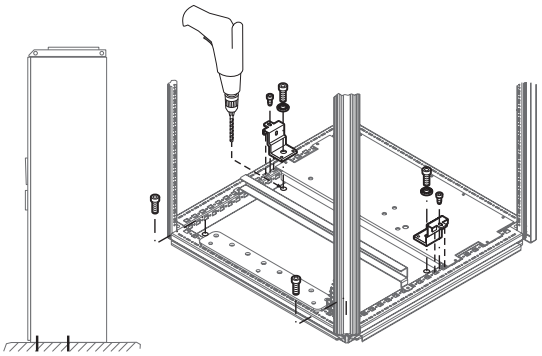


Dimensions are in millimeters and (inches).

Floor and Wall Mounting for Frame 10-13 Size Drives

Floor Only Mounting

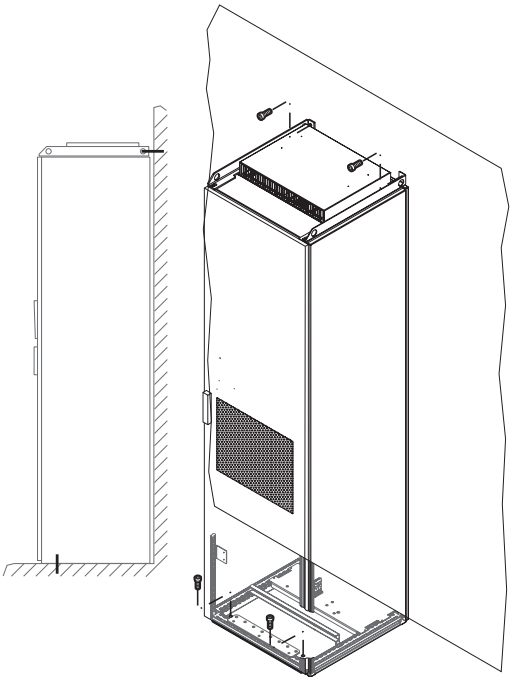
Secure drive to the floor with anchor bolts in the front corner holes of the enclosure base plate. Additionally secure the drive using the mounting plates as needed (Rittal part no. 8800-210 or equivalent). Do this as close to the choke assembly plate as possible. With this method the holes through base plate must be drilled on-site.



Important: If it is important to align the drive cabinet vertically with adjacent Rittal cabinets, you may need to place shims under the drive cabinet or use leveling feet throughout the cabinet line-up. The Allen-Bradley factory may have removed the standard plastic plugs from the bottom of the cabinet when installing the shipping feet. This reduces the height of the cabinet by 2 mm.

Wall Mounting

Secure drive to the floor with anchor bolts in the front corner holes of the enclosure base plate. Secure the drive by bolting the adjustable lifting rails to the rear wall or supporting structure.



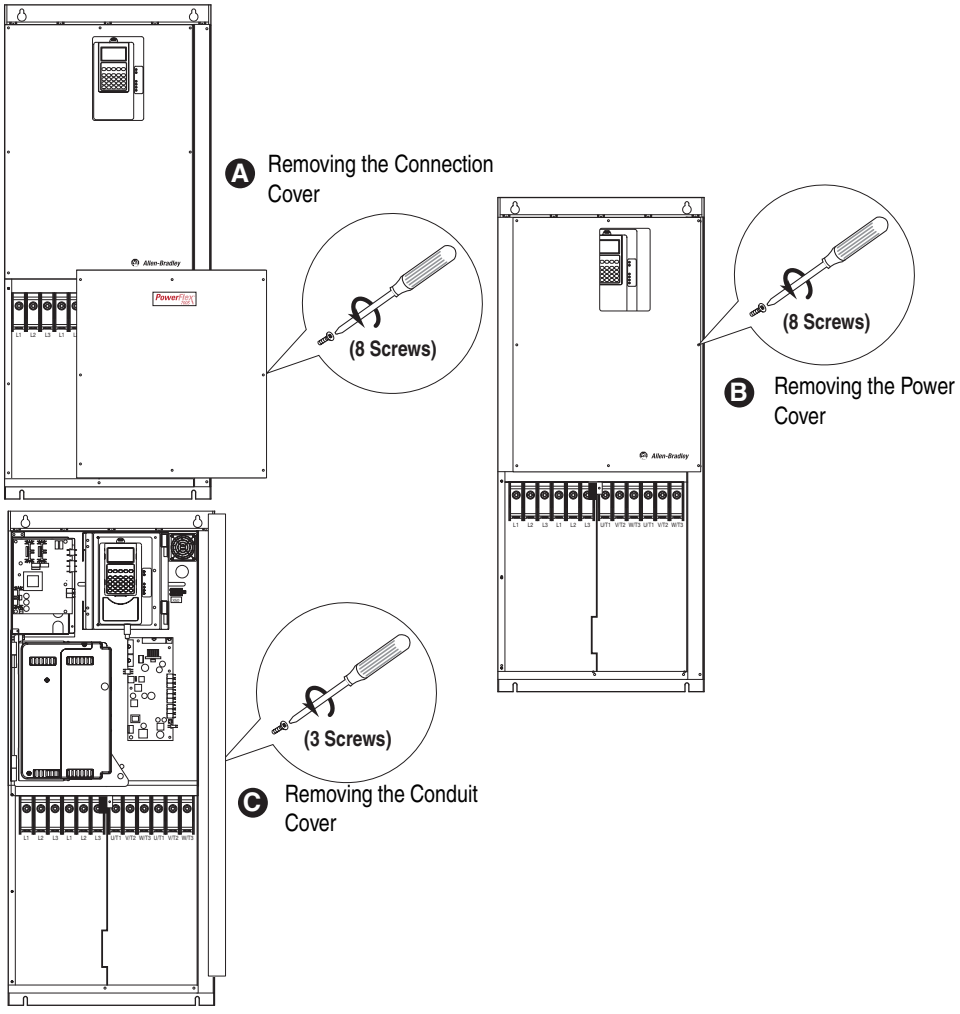
Enclosed Frame 13 Drives with DC Input

Enclosed Frame 13 Drives with DC Input are shipped with the control pan mounted in the motor connection area of the right-hand cabinet. The control pan must be moved from this location to another cabinet, away from the power connections.

Step 5: Removing Protective Covers

- For removing the protective covers from frame 9 size drives, see "Removing the Covers from Frame 9 Size Drives" below.
- For removing the protective covers from frame 10 - 13 size drives, see page 25.

Removing the Covers from Frame 9 Size Drives



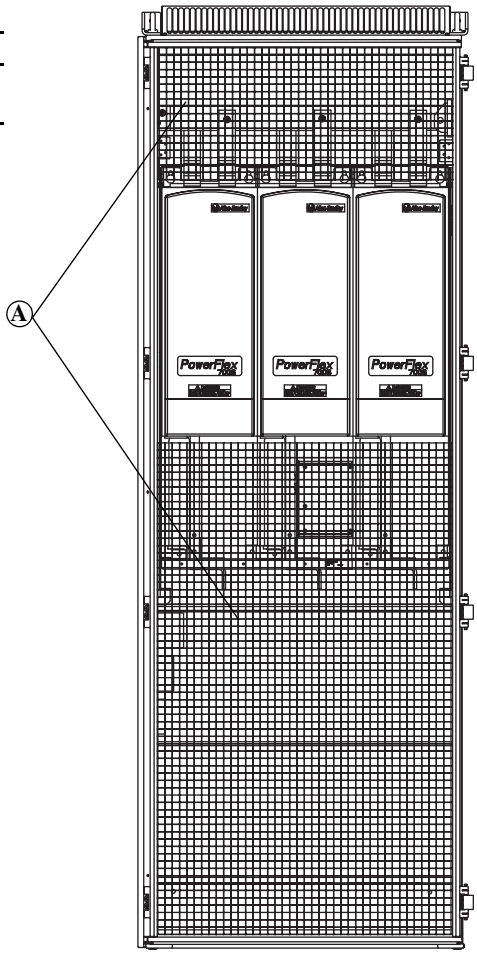
When you have completed removing the covers, continue with Step 6: Configuring Drive for Ground System on page -27.

Removing the Covers from Frame 10 - 13 Size Drives

To remove the protective covers from frame 10 - 13 size drives, you must first move the Protective Screens (frame 13 only), Control Frame (frames 10 - 13 only) and the Airflow Plate.

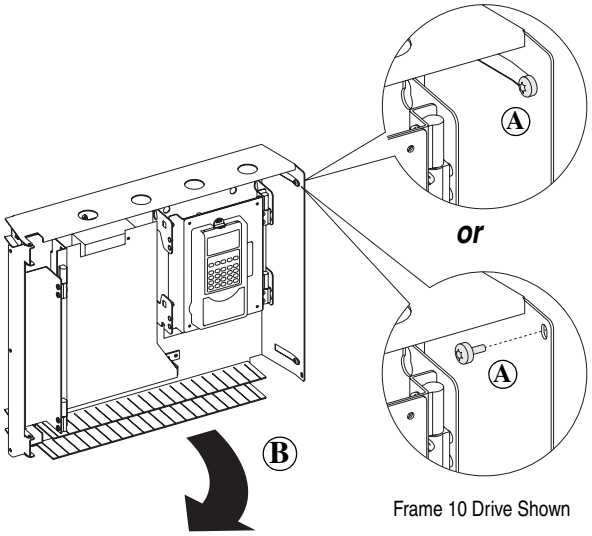
Removing Protective Screens (Frame 13 Only)

Task	Description
Ⓐ	For NEMA/UL Type 1 enclosures, remove the screws that secure the protective screens to the right-hand enclosure only and remove the screens.



Moving Control Frame (Frames 10 - 12 Only)

Task	Description
Ⓐ	Loosen the two T8 Torx-head screws, which secure the Control Frame to the drive enclosure (Frame 10 drives, from early production runs, have holes instead of slots for these screws. You must completely remove the screws from these drives in order to swing-open the control frame.).
Ⓑ	Swing the Control Frame out and away from the power structure.

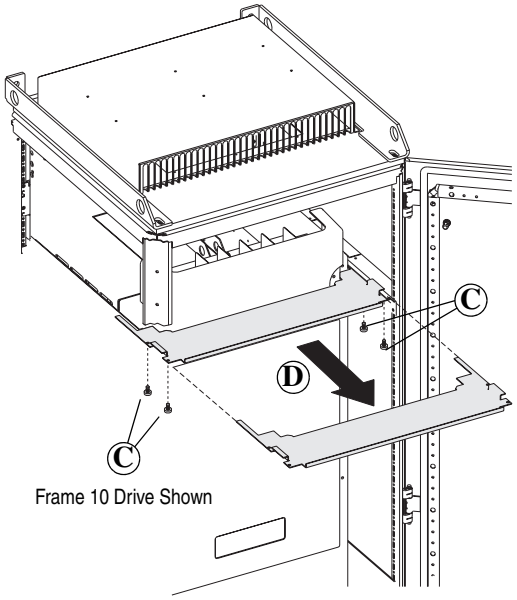


Frame 10 Drive Shown

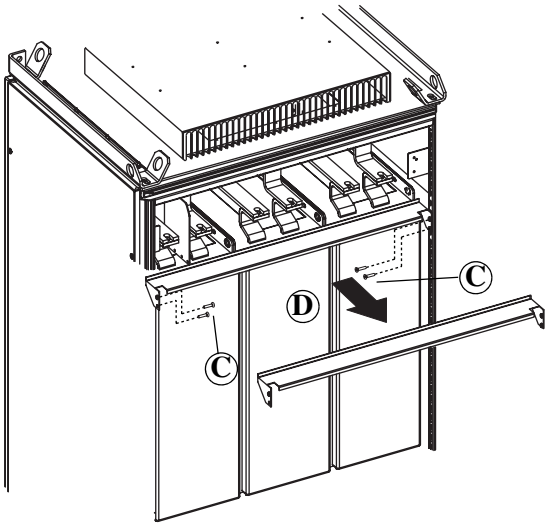
Removing the Covers from Frame 10 - 13 Size Drives, Continued

Removing the Airflow Plate(s)

Task	Description
Ⓒ	Remove the four T8 Torx-head screws which secure the airflow plate to the drive.
Ⓓ	Slide airflow plate off of the drive.



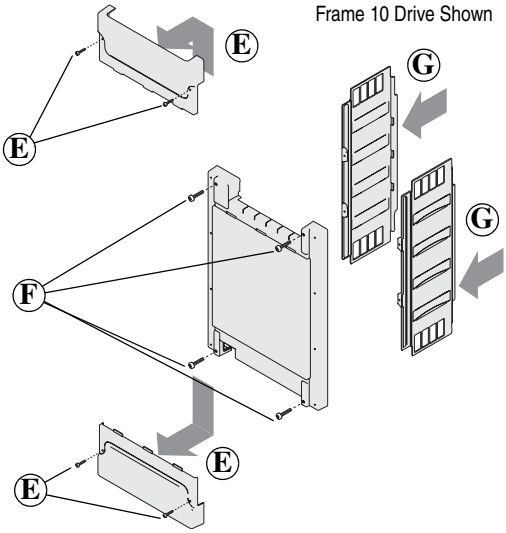
Frame 10 Drive Shown



Removing Protective Covers (Frames 10 - 12)

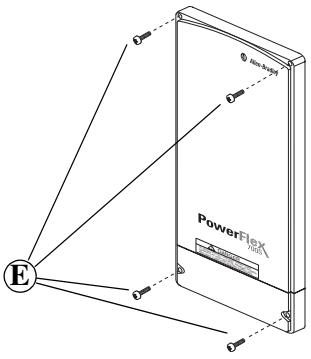
Task	Description
Ⓔ	Remove the four M5 Pozi-drive screws which secure the top and bottom protective covers to the main front protective cover, then remove the top and bottom protective covers. **Note:** You only need to remove the top and bottom covers to gain access to the power terminals. You can remove the other covers without removing the top and bottom covers.
Ⓕ	Remove the four M5 Pozi-drive screws which secure the main front protective cover to the drive, then remove the protective cover.
Ⓖ	Remove side protective covers (Not necessary for frame 11 and 12 size drives).

Frame 10 Drive Shown



Removing Protective Covers (Frame 13 Only)

Task	Description
Ⓔ	Remove the four M5 Pozi-drive screws which secure each of the three main and bottom protective covers to the drive, then remove the main and bottom protective covers. **Note:** You only need to remove the bottom cover to gain access to the power terminals.



Step 6: Configuring Drive for Ground System

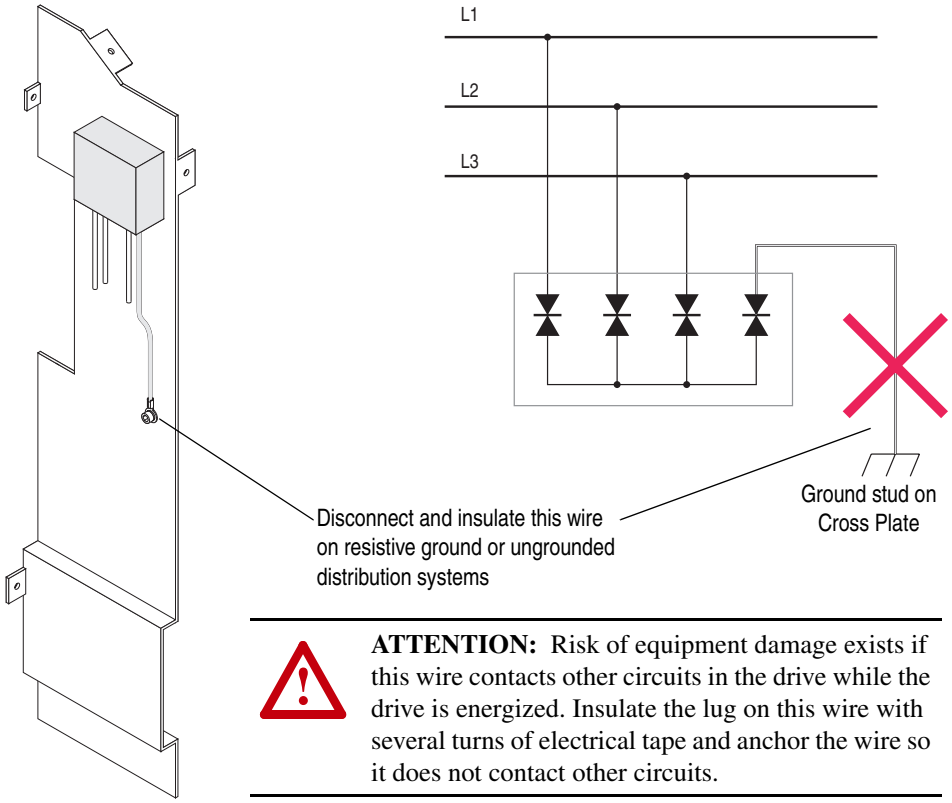
- For configuring frame 9 size drives for a ground system, see “Frame 9 Size Drives” below.
- For configuring frame 10 - 13 size drives for a ground system, see "Frame 10-13 Size Drives" on page 28.

Frame 9 Size Drives

CE frame 9 size drives are equipped with common mode capacitors that are referenced to ground. Operating a CE frame 9 drive on a resistive ground or ungrounded distribution system could result in drive damage.

ATTENTION: If you intend to operate a Frame 9 drive on a resistive ground or ungrounded distribution system, you must order a non-CE PowerFlex High Power drive.

All frame 9 drives (CE and non-CE) are equipped with a Metal Oxide Varistor (MOV) assembly to provide voltage surge protection. The MOV is designed for transient surge suppression only (not continuous operation). With a resistive ground or ungrounded distribution system the phase-to-ground MOV connection could become a continuous current path. Therefore, you should disconnect the MOV ground connection when installing a frame 9 drive on a resistive ground or ungrounded distribution system. Refer to publication PFLEX-RM003…, *PowerFlex® 700S with Phase II Control Reference Manual*, for information on resistive ground or ungrounded system installations.



ATTENTION: Risk of equipment damage exists if this wire contacts other circuits in the drive while the drive is energized. Insulate the lug on this wire with several turns of electrical tape and anchor the wire so it does not contact other circuits.

Continue with Step 7: Power Wiring on page -34.

Frame 10-13 Size Drives

Frame 10-13 size drives are equipped with common mode capacitors that are referenced to ground. To guard against drive damage, these capacitors should be disconnected if the drive is installed on a resistive ground or ungrounded distribution system or on a grounded B phase Delta system. For installations on a resistive ground or ungrounded distribution system, refer to "Installation on a Resistive Ground or Ungrounded Distribution System" on page 29. For installations on a grounded B phase Delta system on a voltage distribution system, refer to "Installation on a Grounded B Phase Delta System" on page 31.

Note: Refer to publication PFLEX-RM003…, *PowerFlex® 700S with Phase II Control Reference Manual*, for information on a resistive ground or ungrounded distribution system installation.

Important: There is one jumper on each Rectifying Module. For drives with multiple Rectifying Modules, all jumpers must be in the same position.

Frame Size	Number of Rectifying Modules (Number of Jumpers)	Location of Rectifying Module(s)
10	1	Upper-right side of the drive's power structure.
11	2	Upper-right side of the center and right hand power stacks of the drive's power structure.
12	2	Upper-right side of the right hand power stacks in each cabinet of the drive's power structure. Note: The jumpers on both Rectifying Modules must be in the same position.
13	2 - 600V class drives and 400V, 1150A drives	Upper-right side of the power stacks in the left hand cabinet of the drive's power structure. Note: The jumpers on all of the Rectifying Modules must be in the same position.
	3 - 400V, 1300A and 1450A drives	

Installation on a Resistive Ground or Ungrounded Distribution System

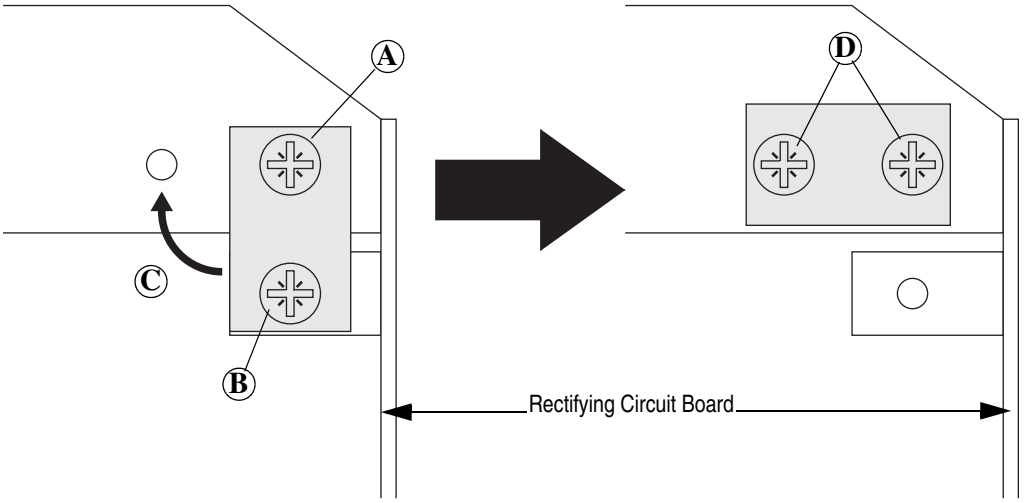
The jumper on frame 10 - 12 size drives is different than the jumper on frame 13 size drives. Refer to “Frame 10 - 12 Size Drives” below or to "Frame 13 Size Drives:" on page 30 for the appropriate procedure for your drive frame size.

Frame 10 - 12 Size Drives:

1. To disconnect the capacitors, move the jumper as shown below.

Task	Description
Ⓐ	Loosen the upper screw.
Ⓑ	Remove the lower screw.
Ⓒ	Move the jumper to the horizontal position.
Ⓓ	Install and tighten all screws.

Continue with step 2 on page 33.



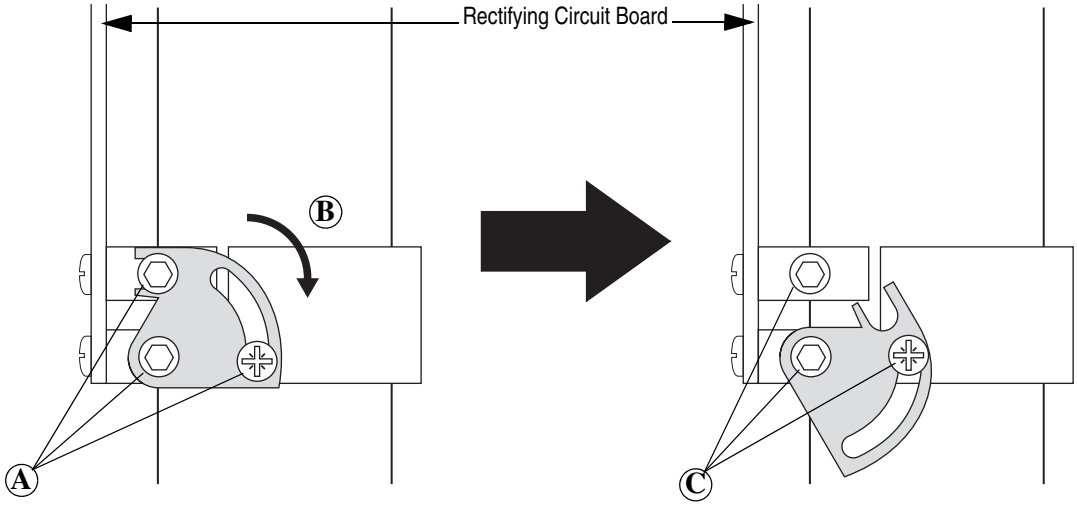
Installation on a Resistive Ground or Ungrounded Distribution System, Continued

Frame 13 Size Drives:

To disconnect the capacitors, move the jumper as shown below.

Task	Description
Ⓐ	Loosen the three screws.
Ⓑ	Rotate the jumper to the lower position.
Ⓒ	Tighten the three screws.

Continue with “Step 7: Power Wiring” on page 34.



Installation on a Grounded B Phase Delta System

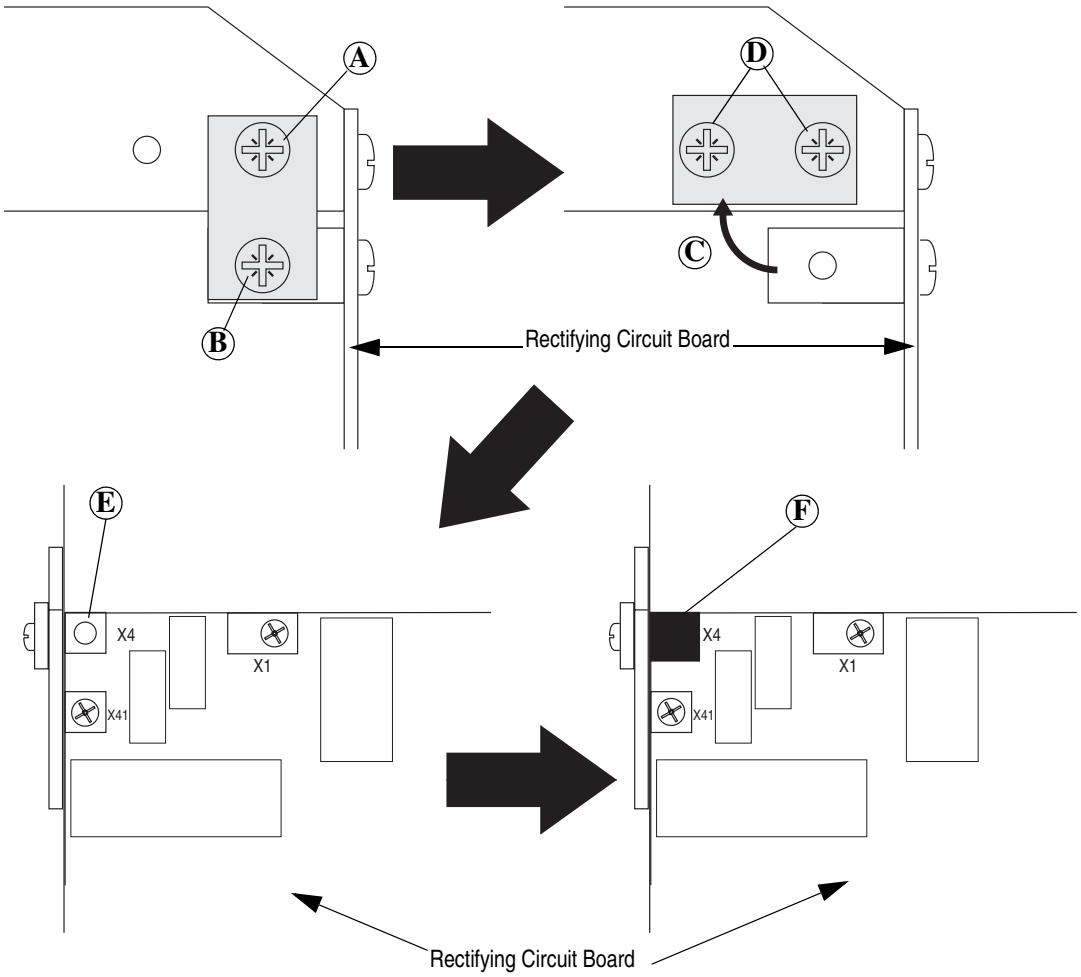
The jumper on frame 10 - 12 size drives is different than the jumper on frame 13 size drives. Refer to “Frame 10 - 12 Size Drives” below or to "Frame 13 Size Drives:" on page 32 for the appropriate procedure for your drive frame size.

Frame 10 - 12 Size Drives:

1. To use a grounded B phase delta system, follow the steps below.

Task	Description
Ⓐ	Loosen the upper screw on the common mode capacitor jumper.
Ⓑ	Remove the lower screw.
Ⓒ	Move the jumper to the horizontal position.
Ⓓ	Install and tighten all screws.
Ⓔ	Remove the screw from the X4 connection on the Rectifying circuit board.
Ⓕ	Insulate the top and bottom of the X4 connection on the Rectifying circuit board.

Continue with step 2 on page 33.

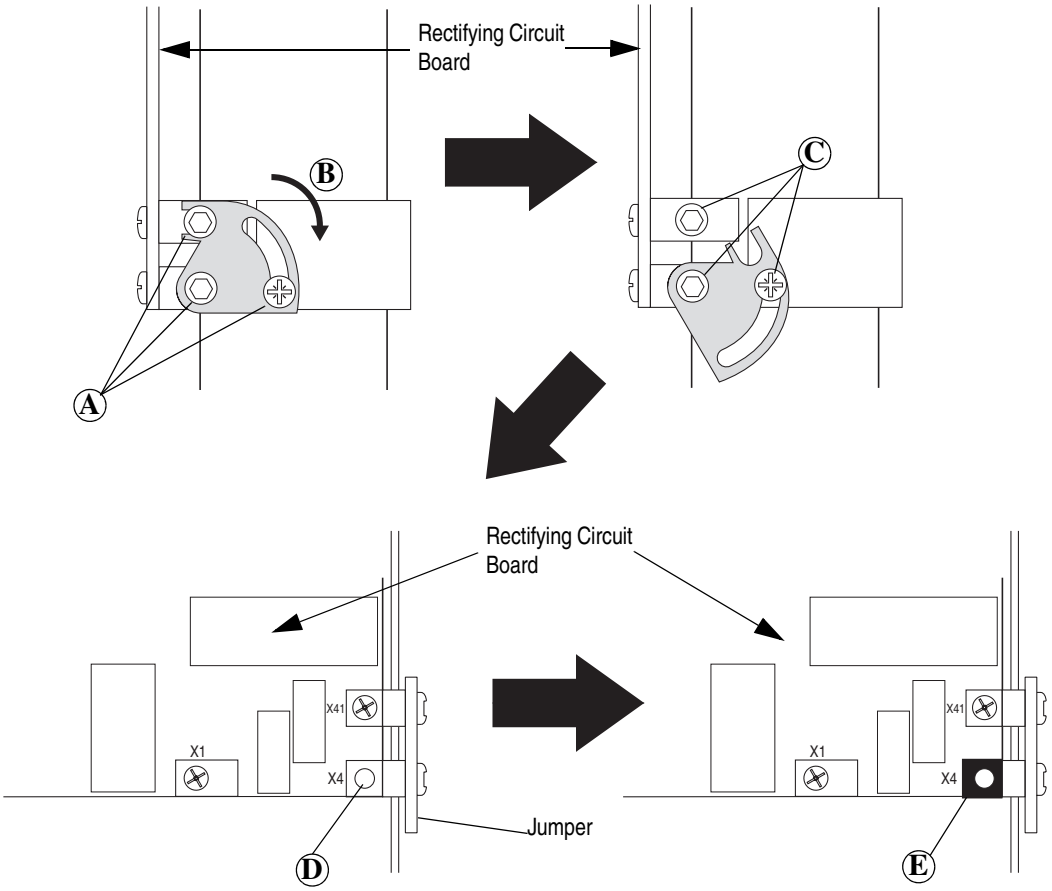


Installation on a Grounded B Phase Delta System, Continued

Frame 13 Size Drives:

Task	Description
Ⓐ	Loosen the three screws.
Ⓑ	Rotate the jumper to the lower position.
Ⓒ	Tighten the three screws.
Ⓓ	Remove the screw from the X4 connection on the Rectifying circuit board.
Ⓔ	Insulate the top and bottom of the X4 connection on the Rectifying circuit board.

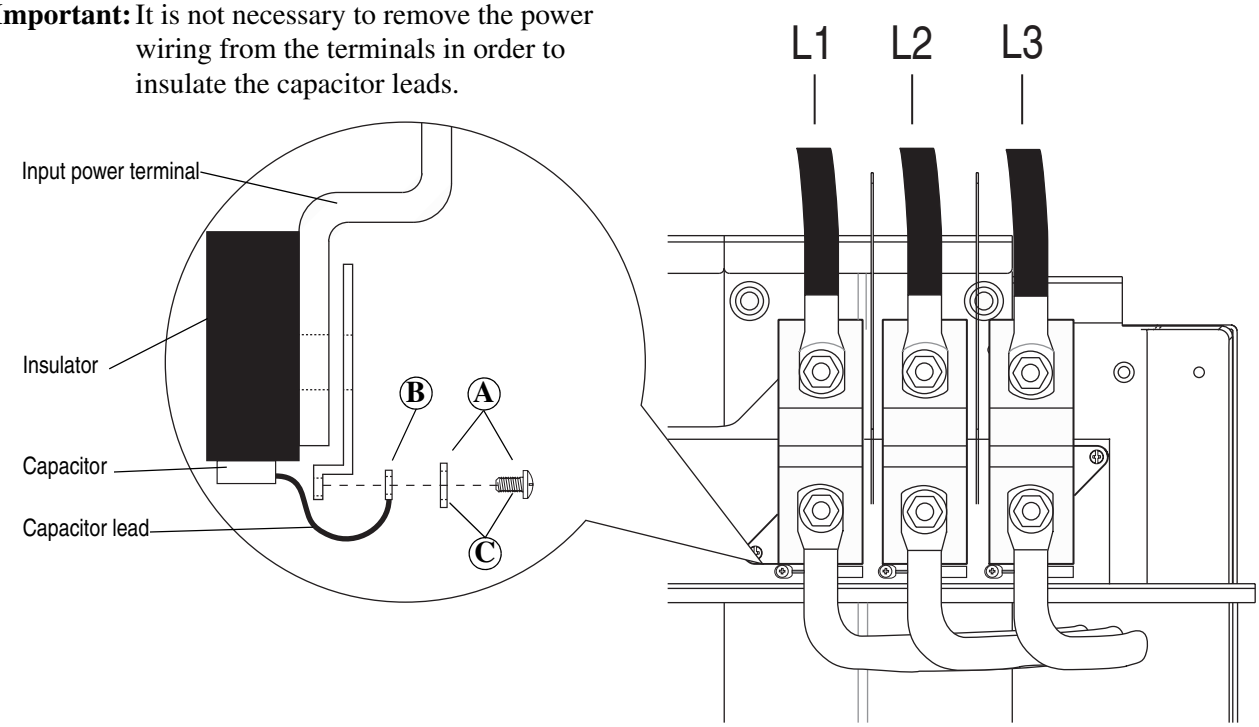
Continue with “Step 7: Power Wiring” on page 34.



2. Insulate the capacitors from the drive's input power terminals.

Task	Description
Ⓐ	Remove the screws and lock washers that secure each of the three capacitor supply wires to the input power terminals.
Ⓑ	Insulate the capacitor leads.
Ⓒ	Install and tighten the screws and lock washers only.

Important: It is not necessary to remove the power wiring from the terminals in order to insulate the capacitor leads.



Continue with "Step 7: Power Wiring" on page 34.

Step 7: Power Wiring

Wire Recommendations

ATTENTION: National Codes and standards (NEC, VDE, BSI etc.) and local codes outline provisions for safely installing electrical equipment. Installation must comply with specifications regarding wire types, conductor sizes, branch circuit protection and disconnect devices. Failure to do so may result in personal injury and/or equipment damage.

Cable Types Acceptable for 200-690 Volt Installations

A variety of cable types are acceptable for drive installations. For many installations, unshielded cable is adequate, provided it can be separated from sensitive circuits. As an approximate guide, allow a spacing of 0.3 meters (1 foot) for every 10 meters (32.8 feet) of length. In all cases, long parallel runs must be avoided. Do not use cable with an insulation thickness less than or equal to 15 mils (0.4mm/0.015 in.). Use Copper wire only. Wire gauge requirements and recommendations are based on 75 degrees C. Do not reduce wire gauge when using higher temperature wire.

Important: For detailed information on motor cable length restrictions, refer to Appendix A, "Motor Cable Length Restrictions Tables" in *Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives*, publication DRIVES-IN001….

Unshielded Cable

THHN, THWN or similar wire is acceptable for drive installation in dry environments provided adequate free air space and/or conduit fill rates limits are provided. **Do not use THHN or similarly coated wire in wet areas**. Any wire chosen must have a minimum insulation thickness of 15 Mils and should not have large variations in insulation concentricity.

Shielded Cable

Shielded cable contains all of the general benefits of multi-conductor cable with the added benefit of a copper braided shield that can contain much of the noise generated by a typical AC Drive. Strong consideration for shielded cable should be given in installations with sensitive equipment such as weigh scales, capacitive proximity switches and other devices that may be affected by electrical noise in the distribution system. Applications with large numbers of drives in a similar location, imposed EMC regulations or a high degree of communications/ networking are also good candidates for shielded cable.

Shielded cable may also help reduce shaft voltage and induced bearing currents for some applications. In addition, the increased impedance of shielded cable may help extend the distance that the motor can be located from the drive without the addition of motor protective devices such as terminator networks. Refer to Chapter 5, "Reflected Wave" in *Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives*, publication DRIVES-IN001….

Consideration should be given to all of the general specifications dictated by the environment of the installation, including temperature, flexibility, moisture

characteristics and chemical resistance. In addition, a braided shield should be included and be specified by the cable manufacturer as having coverage of at least 75%. An additional foil shield can greatly improve noise containment.

A good example of recommended cable is Belden® 295xx (xx determines gauge). This cable has four (4) XLPE insulated conductors with a 100% coverage foil and an 85% coverage copper braided shield (with drain wire) surrounded by a PVC jacket.

Other types of shielded cable are available, but the selection of these types may limit the allowable cable length. Particularly, some of the newer cables twist 4 conductors of THHN wire and wrap them tightly with a foil shield. This construction can greatly increase the cable charging current required and reduce the overall drive performance. Unless specified in the individual distance tables as tested with the drive, these cables are not recommended and their performance against the lead length limits supplied is not known.

Armored Cable

Cable with continuous aluminum armor is often recommended in drive system applications or specific industries. It offers most of the advantages of standard shielded cable and also combines considerable mechanical strength and resistance to moisture. It can be installed in concealed and exposed manners and removes the requirement for conduit (EMT) in the installation. It can also be directly buried or embedded in concrete.

Because noise containment can be affected by incidental grounding of the armor to building steel (see Chapter 2. “Wire Types,” of publication DRIVES-IN001…, *Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives*) when the cable is mounted, it is recommended the armored cable have an overall PVC jacket.

Interlocked armor is acceptable for shorter cable runs, but continuous welded armor is preferred.

Best performance is achieved with 3 spaced ground conductors, but acceptable performance below 200 HP is provided via a single ground conductor. See Table E.

Table E Recommended Shielded / Armored Cable

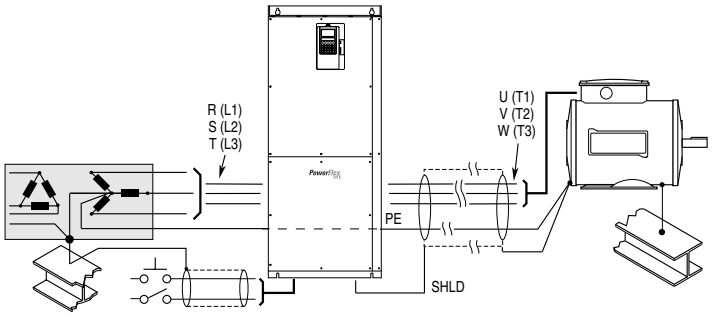
Location	Rating/Type	Description
Standard (Option 1)	600V, 90° C (194° F) XHHW2/RHW-2 Anixter B209500-B209507, Belden 29501-29507, or equivalent	• Four tinned copper conductors with XLPE insulation. • Copper braid/aluminum foil combination shield and tinned copper drain wire. • PVC jacket.
Standard (Option 2)	Tray rated 600V, 90° C (194° F) RHH/RHW-2 Anixter OLF-7xxxxx or equivalent	• Three tinned copper conductors with XLPE insulation. • 5 mil single helical copper tape (25% overlap min.) with three bare copper grounds in contact with shield. • PVC jacket.
Class I & II; Division I & II	Tray rated 600V, 90° C (194° F) RHH/RHW-2 Anixter 7V-7xxxx-3G or equivalent	• Three bare copper conductors with XLPE insulation and impervious corrugated continuously welded aluminum armor. • Black sunlight resistant PVC jacket overall. • Three copper grounds on #10 AWG and smaller.

General Grounding Requirements

The drive Safety Ground - PE must be connected to system ground. Ground impedance must conform to the requirements of national and local industrial safety regulations and/or electrical codes. The integrity of all ground connections should be periodically checked.

For installations within a cabinet, a single safety ground point or ground bus bar connected directly to building steel should be used. All circuits including the AC input ground conductor should be grounded independently and directly to this point/bar.

Figure 1 Typical Grounding



Safety Ground - PE

This is the safety ground for the drive that is required by code. This point must be connected to adjacent building steel (girder, joist), a floor ground rod or bus bar (see above). Grounding points must comply with national and local industrial safety regulations and/or electrical codes.

Shield Termination - SHLD

The Shield terminal provides a grounding point for the motor cable shield. It must be connected to an earth ground by a separate continuous lead. The **motor cable** shield should be connected to this terminal on the drive (drive end) and the motor frame (motor end). A shield terminating cable gland may also be used.

When shielded cable is used for **control and signal wiring**, the shield should be grounded at the source end only, not at the drive end.

RFI Filter Grounding

Using an optional RFI filter may result in relatively high ground leakage currents. Therefore, the **filter must only be used in installations with grounded AC supply systems and be permanently installed and solidly grounded** (bonded) to the building power distribution ground. Ensure that the incoming supply neutral is solidly connected (bonded) to the same building power distribution ground. Grounding must not rely on flexible cables and should not include any form of plug or socket that would permit inadvertent disconnection. Some local codes may require redundant ground connections. The integrity of all connections should be periodically checked. Refer to the instructions supplied with the filter.

DC Input Precharge Wiring

If you are installing a DC input drive with a precharge interlock you must make the following connections on the X50 terminal block from the precharge circuit.

Important: Precharge circuitry is external to the drive.

Figure 2 Sample Precharge Wiring Diagram (Frame 9 Shown)

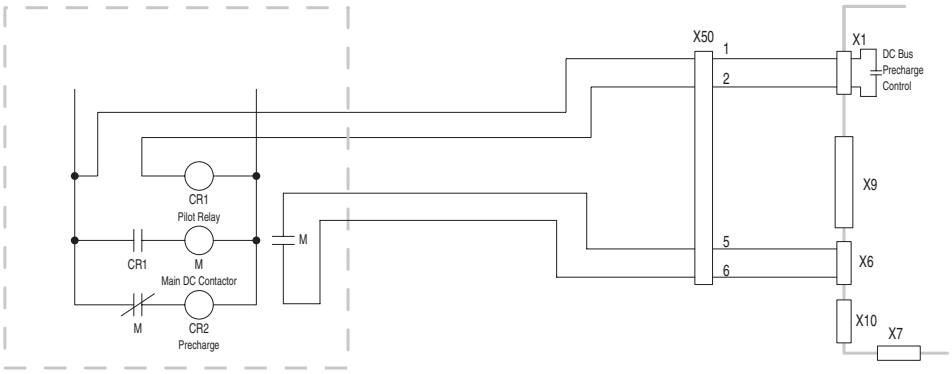
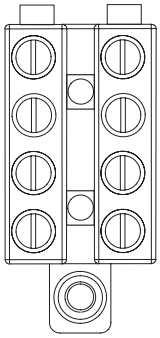


Table F X50 Terminal Block Connections



Frame	X50 Terminal	Description
9	1	Charge Relay Contact
	2	Charge Relay Contact
	5	Precharge Complete Signal (+24V DC)
	6	Precharge Complete Signal (Common)
10, 11, & 13	3	Charge Relay Contact
	4	Charge Relay Contact
	1	Precharge Complete Signal (+24V DC)
	2	Precharge Complete Signal (Common)
12	Power Module 1	
	3	Charge Relay Contact (Jumper to Power Module 2 Terminal 23)
	4	Charge Relay Contact
	1	Precharge Complete Signal (+24V DC)
	2	Precharge Complete Signal (Common)
	Power Module 2	
	3	Charge Relay Contact
	4	Charge Relay Contact (Jumper to Power Module 1 Terminal 21)
	1	Precharge Complete Signal (+24V DC)
	2	Precharge Complete Signal (Common)

Table G X50 Terminal Block Specifications

Wire Size Range(1)		Torque
Maximum	Minimum	Recommended
6.0 mm^2 (10 AWG)	1.0 mm^2 (18 AWG)	0.8 N-m (7.0 lb.-in.)

(1) Maximum/minimum sizes that the terminal block will accept - these are not recommendations.

Figure 3 Frame 9 X50 Terminal Block Location

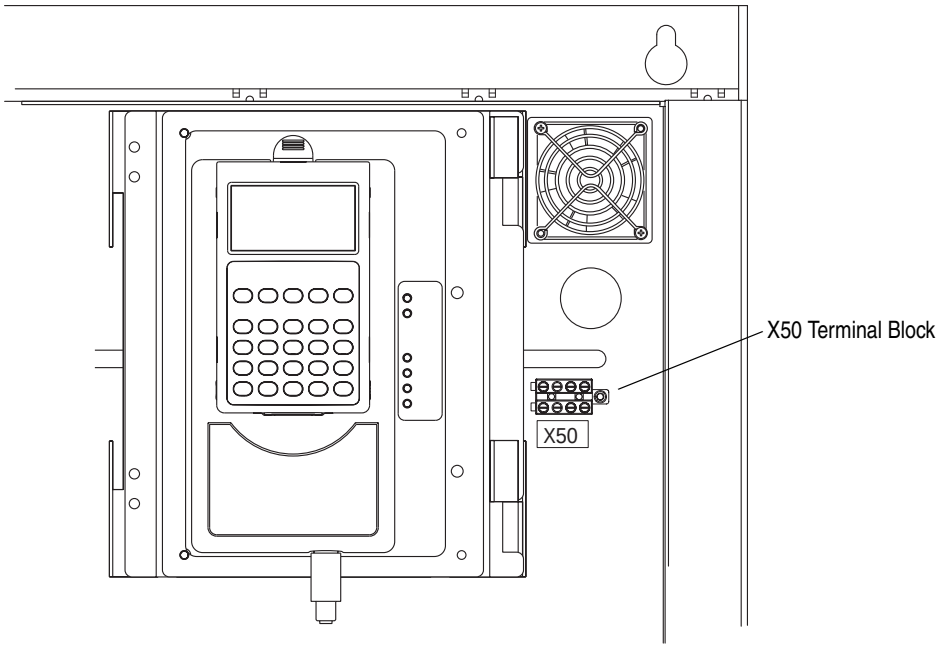
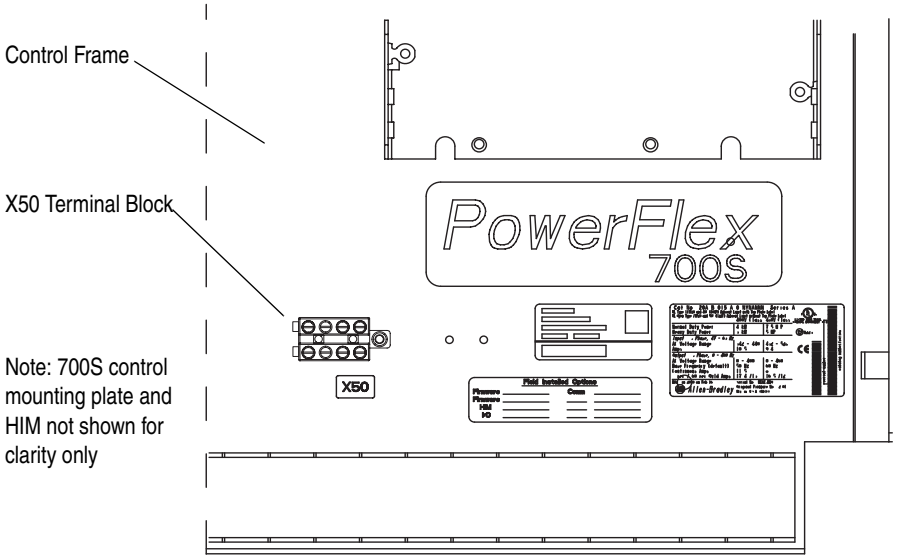


Figure 4 Frame 10 - 13 X50 Terminal Block Location



Power Wiring Instructions

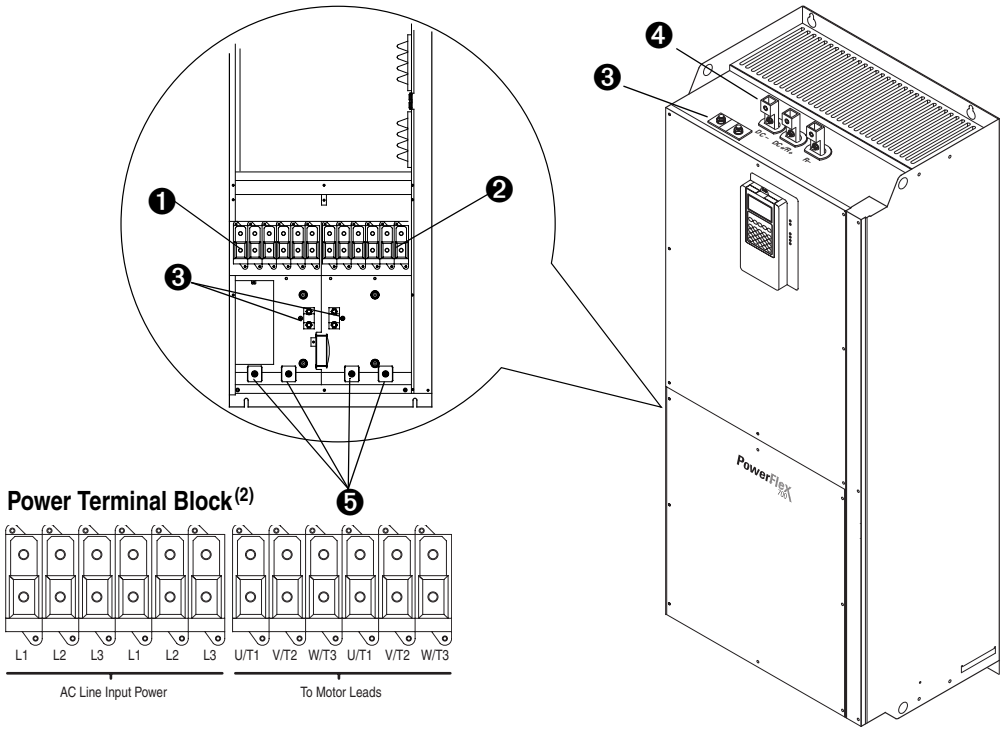
- For power wiring instructions for frame 9 size drives, see “Frame 9 Size Drives” below.
- For power wiring instructions for frame 10 size drives, see page 40.
- For power wiring instructions for frame 11 size drives, see page 41.
- For power wiring instructions for frame 12 size drives, see page 44.
- For power wiring instructions for frame 13 size drives, see page 47.

Note: If you are installing an ATEX approved drive and motor, refer to "ATEX Approved PowerFlex 700S Phase II Drives in Group II Category (2) Applications with ATEX Approved Motors" on page 70 for more information on power wiring.

Frame 9 Size Drives

No.	Name	Description	Wire Size Range[1]		Torque
			Maximum	Minimum	Recommended
❶	Input Power Terminal Block[2] L1, L2, L3	Input power	185.0 mm^2 (350 MCM)	95.0 mm^2 (4/0 AWG)	40 N-m (354 lb.-in.)
❷	Output Power Terminal Block[2] U/T1, V/T2, W/T3	Motor connections	185.0 mm^2 (350 MCM)	95.0 mm^2 (4/0 AWG)	40 N-m (354 lb.-in.)
❸	SHLD Terminal, PE, Motor Ground	Terminating point for wiring shields	95.0 mm^2 (4/0 AWG)	5.0 mm2 (10 AWG)	22 N-m (195 lb.-in.)
❹	DC Bus[3] (2 Terminals; DC–, DC+)	DC input or external brake *(Internal Brake option not ordered)*	185.0 mm^2 (350 MCM)	95.0 mm^2 (4/0 AWG)	40 N-m (354 lb.-in.)
	DC Bus w/Brake[3] (3 Terminals; DC–, DC+/R+, R–)	DC input/internal brake *(Internal Brake option is ordered)*	185.0 mm^2 (350 MCM)	95.0 mm^2 (4/0 AWG)	40 N-m (354 lb.-in.)
❺	Cable Clamp for Shield				

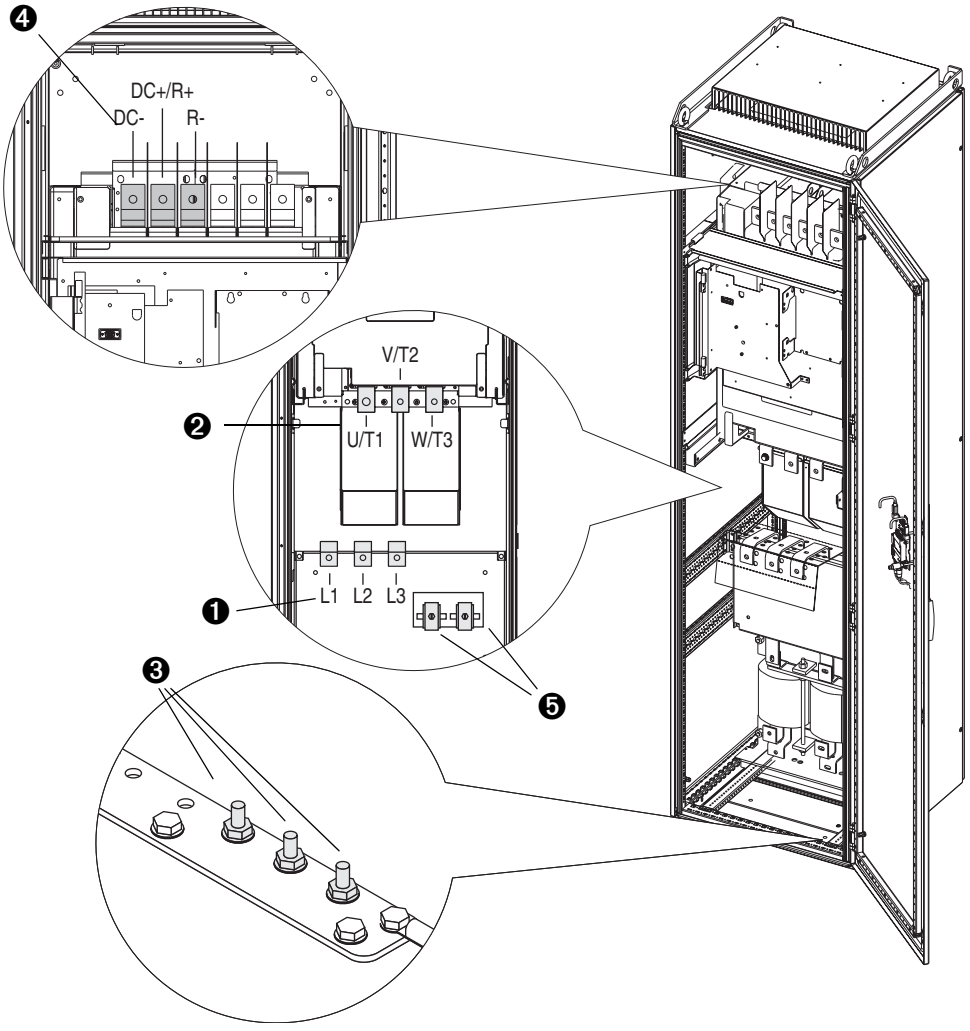
(1) Maximum/minimum sizes that the terminal block will accept - these are not recommendations.
(2) Do Not exceed maximum wire size. Parallel connections may be required.
(3) DC terminal and brake lugs can be removed.



Frame 10 Size Drives

No.	Name	Description	Wire Size Range[1][2] Maximum	Wire Size Range[1][2] Minimum	Torque Recommended	Terminal Bolt Size[3] [4]
❶	Input Power Terminal Block L1, L2, L3[3]	Input power	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M12
❷	Output Power Terminal Block[(3] U/T1, V/T2, W/T3	Motor connections	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M12
❸	SHLD Terminal, PE, Motor Ground[3]	Terminating point for wiring shields	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M10
❹	DC Bus[3] (2 Terminals; DC–, DC+)	DC input or external brake *(Internal Brake option not ordered)*	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M12
	DC Bus w/Brake[3] (3 Terminals; DC–, DC+/R+, R–)	DC input/internal brake *(Internal Brake option is ordered)*	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M12
❺	Cable Clamp for Shield					

(1) Maximum/minimum sizes that the terminal block will accept - these are not recommendations.
(2) Do Not exceed maximum wire size. Parallel connections may be required.
(3) These connections are bus bar type terminations and require the use of lug type connectors.
(4) Apply counter torque to the nut on the other side of terminations when tightening or loosening the terminal bolt in order to avoid damage to the terminal.



Frame 11 Size Drives

AC Input Wiring for Frame 11 Drives

600V class - 460 and 502 amp frame 11 drives contain only one rectifying module and therefore only one set of input power terminals. 400V class and 600V class - 590 amp frame 11 size drives utilize two parallel input rectifying modules, and therefore have two sets of input power terminals. You must supply power to both sets of input terminals. There are several methods for accomplishing this. Each of these methods is shown below.

Important: Parallel wiring must have the same cable dimensions, type and routing. Non-symmetrical wiring may cause unequal loading between the converters and reduce the drive's ability to deliver current to the motor.

Figure 5 Frame 11 AC Wiring Example: Two Fuses per Phase

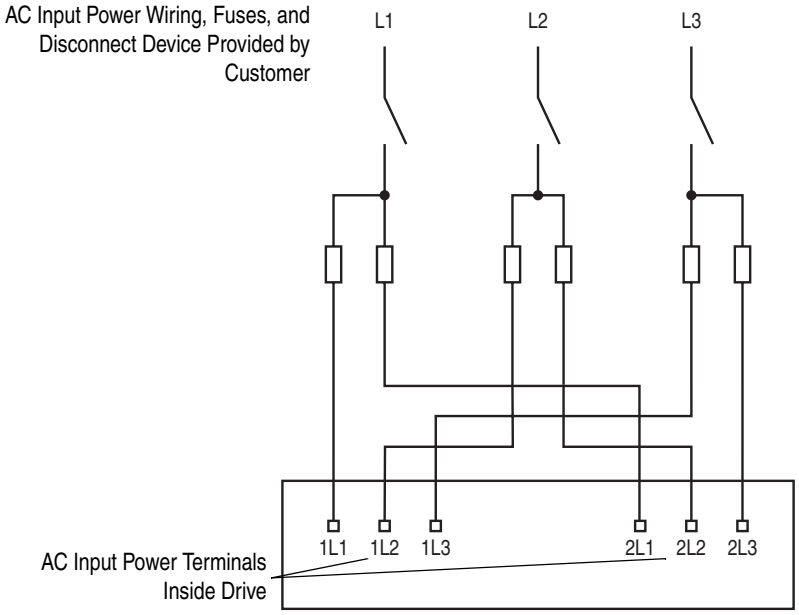


Figure 6 Frame 11 AC Wiring Example: One Fuse per Phase

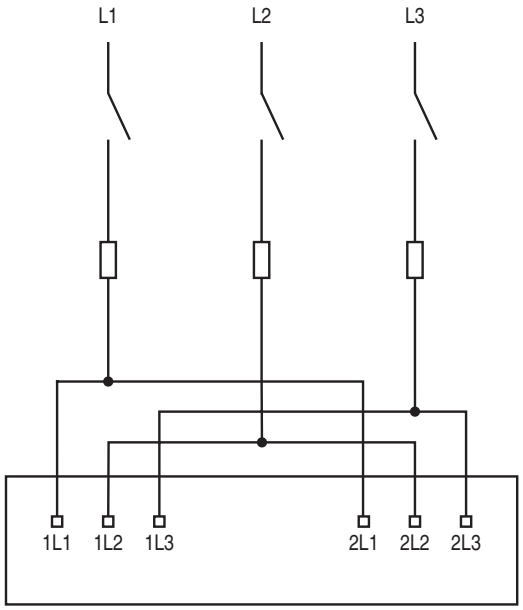


Figure 7 Frame 11 AC Wiring Example: Circuit Breaker

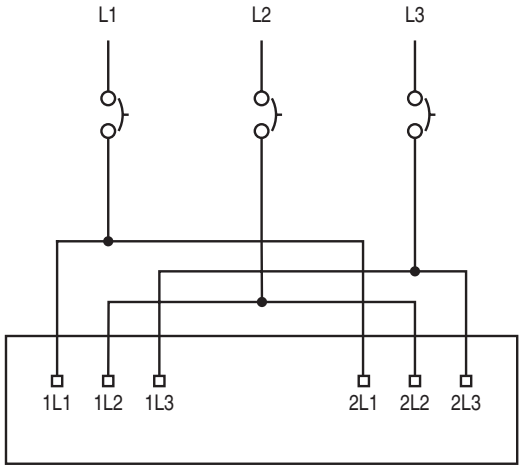


Table H Frame 11 Power Terminal Specifications

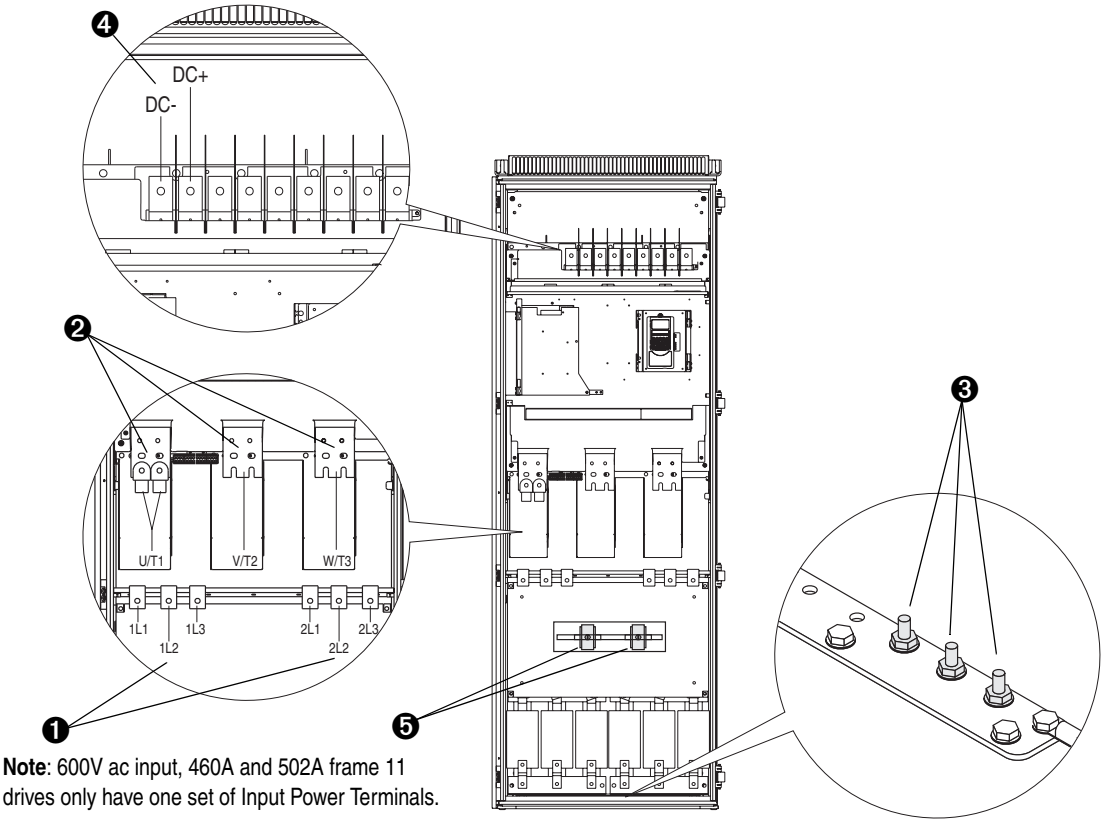
No.	Name	Description	Wire Size Range[1][2]		Torque	Terminal Bolt Size[3] [4]
			Maximum	Minimum	Recommended	
❶	Input Power Terminal Block 1L1, 1L2, 1L3, 2L1, 2L2, 2L3[3]	AC Input power	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M12
❷	Output Power Terminal Block[(3)] U/T1, V/T2, W/T3	Motor connections	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M12
❸	SHLD Terminal, PE, Motor Ground[3]	Terminating point for wiring shields	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M10
❹	DC Bus[3] (2 Terminals; DC–, DC+)	DC input or external brake *(Internal Brake option not ordered)*	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M12
❺	Cable Clamp for Shield					

(1) Maximum/minimum sizes that the terminal block will accept - these are not recommendations.

(2) Do Not exceed maximum wire size. Parallel connections may be required.

(3) These connections are bus bar type terminations and require the use of lug type connectors.
(4) Apply counter torque to the nut on the other side of terminations when tightening or loosening the terminal bolt in order to avoid damage to the terminal.

Figure 8 Frame 11 Terminal Locations



Note: 600V ac input, 460A and 502A frame 11 drives only have one set of Input Power Terminals.

Frame 12 Size Drives

400 and 480 Volt AC Input Wiring for Frame 12 Drives

Frame 12 size drives utilize two parallel power structures, and therefore have two sets of AC input power terminals. You must supply power to both sets of input terminals. There are several methods for accomplishing this. Each of these methods is shown below.

Important: Parallel wiring must have the same cable dimensions, type and routing. Non-symmetrical wiring may cause unequal loading between the converters and reduce the drive's ability to deliver current to the motor.

Figure 9 Frame 12 AC Wiring Example: Two Fuses per Phase

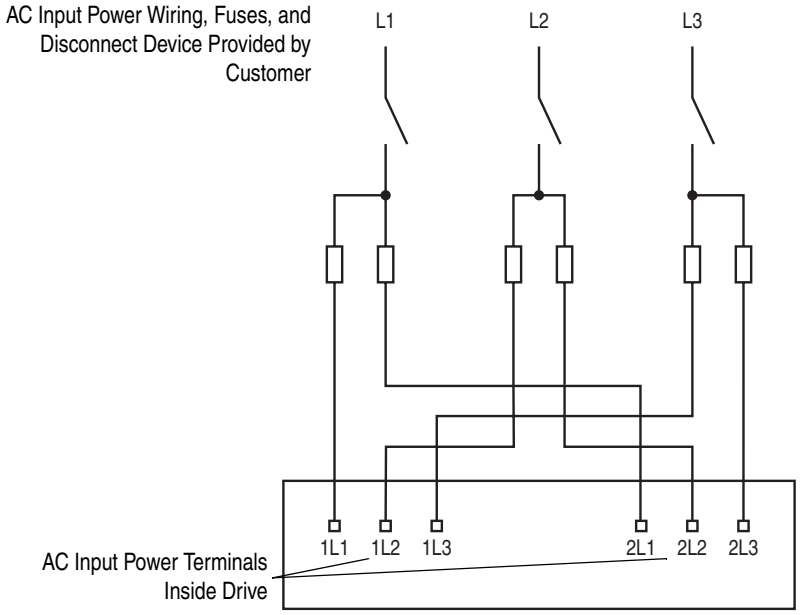


Figure 10 Frame 12 AC Wiring Example: One Fuse per Phase

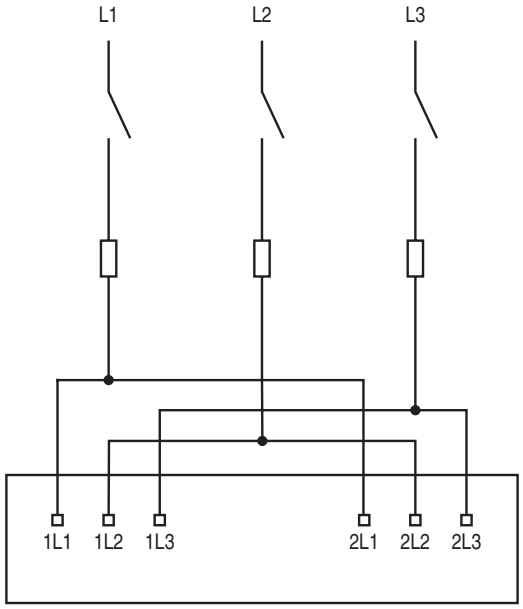
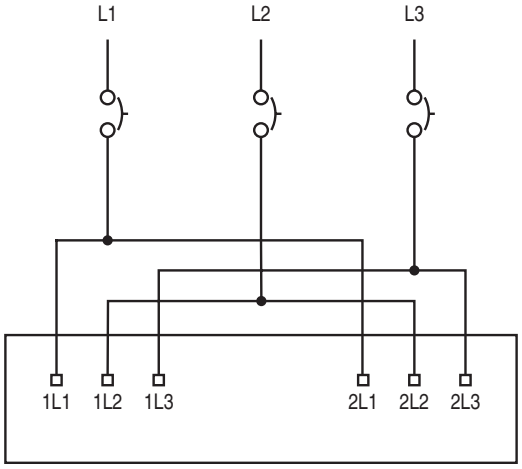


Figure 11 Frame 12 AC Wiring Example: Circuit Breaker



Output Power Wiring for Frame 12 Drives

Frame 12 drives utilize two parallel power structures, and therefore have two sets of output power terminals. You must connect the motor to both sets of output power terminals.

Important: Parallel wiring must have the same cable dimensions, type and routing. Non-symmetrical wiring may cause unequal loading between the converters and reduce the drive's ability to deliver current to the motor.

Important: The minimum cable length for parallel motor cables from the drive to the point where the cables connect is 5m (16.4 ft). Join the parallel cables at the motor end (not the drive end).

Figure 12 Frame 12 Motor Wiring Example

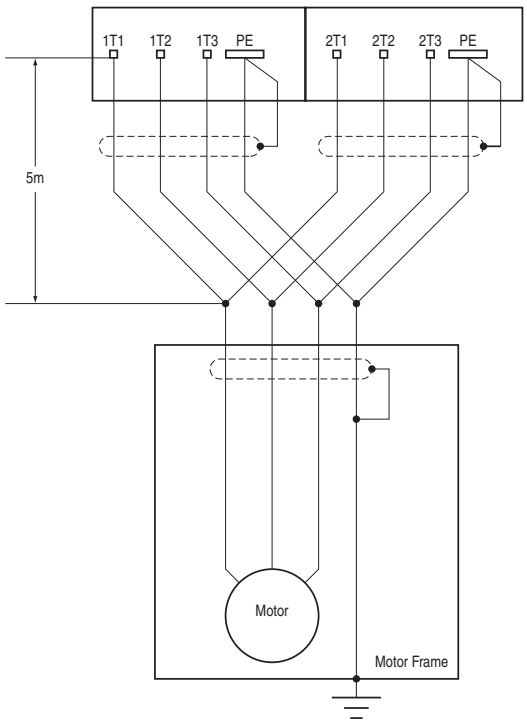
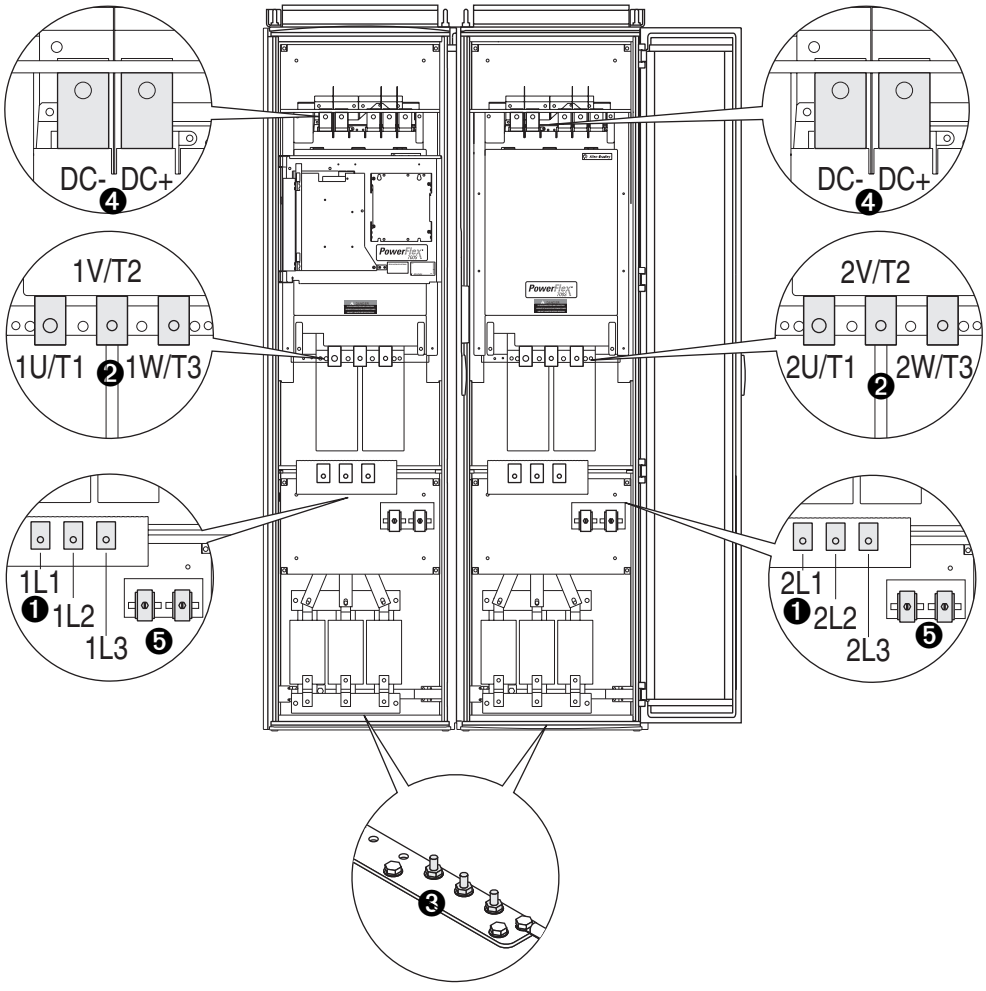


Table I Frame 12 Power Terminal Specifications

No.	Name	Description	Wire Size Range[1][2]		Torque	Terminal Bolt Size[3] [4]
			Maximum	Minimum	Recommended	
❶	Input Power Terminal Block 1L1, 1L2, 1L3, 2L1, 2L2, 2L3[3]	Input power	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M12
❷	Output Power Terminal Block[(3] 1U/1T1, 1V/1T2, 1W/1T3, 2U/2T1, 2V/2T2, 2W/2T3	Motor connections	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M12
❸	SHLD Terminal, PE, Motor Ground[3]	Terminating point for wiring shields	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M10
❹	DC Bus[3] (2 Terminals; DC–, DC+)	DC input or external brake *(Internal Brake option not ordered)*	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M12
	DC Bus w/Brake[3] (3 Terminals; DC–, DC+/R+, R–)	DC input/internal brake *(Internal Brake option is ordered)*	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M12
❺	Cable Clamp for Shield					

(1) Maximum/minimum sizes that the terminal block will accept - these are not recommendations.
(2) Do Not exceed maximum wire size. Parallel connections may be required.
(3) These connections are bus bar type terminations and require the use of lug type connectors.
(4) Apply counter torque to the nut on the other side of terminations when tightening or loosening the terminal bolt in order to avoid damage to the terminal.

Figure 13 Frame 12 Terminal Locations



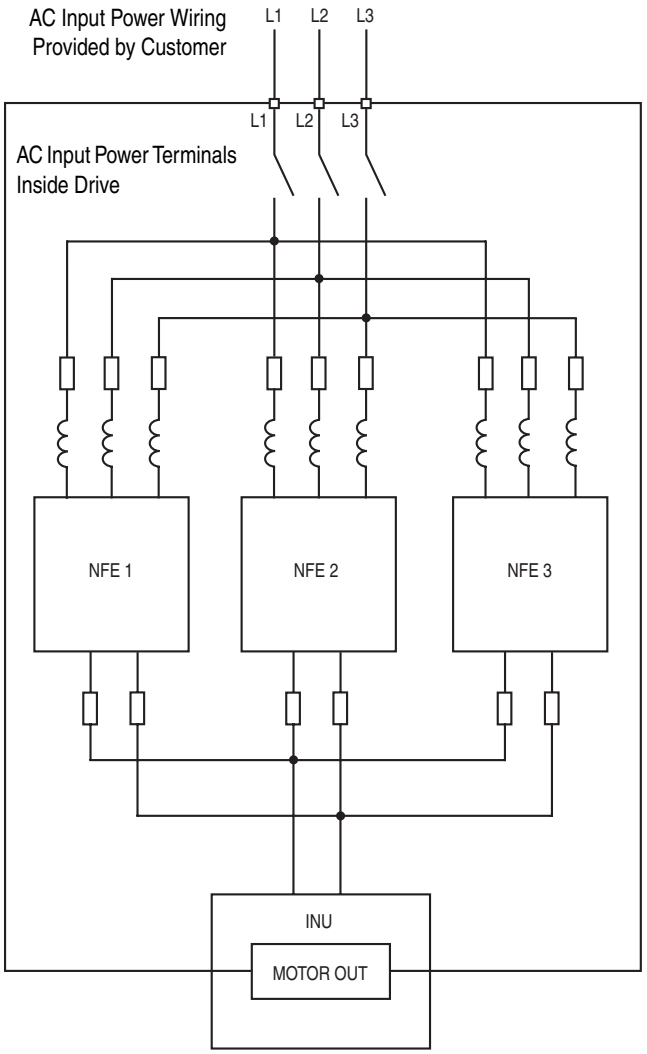
Frame 13 Size Drives

400 and 600 Volt Class AC Input Wiring for Frame 13 Drives

Frame 13 size drives utilize two or three parallel power structures that are pre-connected to line reactors through a fused input switch.

Important: Parallel wiring must have the same cable dimensions, type and routing. Non-symmetrical wiring may cause unequal loading between the converters and reduce the drive's ability to deliver current to the motor.

Figure 14 Frame 13 AC Wiring Example: Three Internal Fuses per Phase



Output Power Wiring for Frame 13 Drives

Connect the motor to the output power terminals.

Important: Parallel wiring must have the same cable dimensions, type and routing. Non-symmetrical wiring may cause unequal loading between the converters and reduce the drive's ability to deliver current to the motor.

Figure 15 Frame 13 Motor Wiring Example

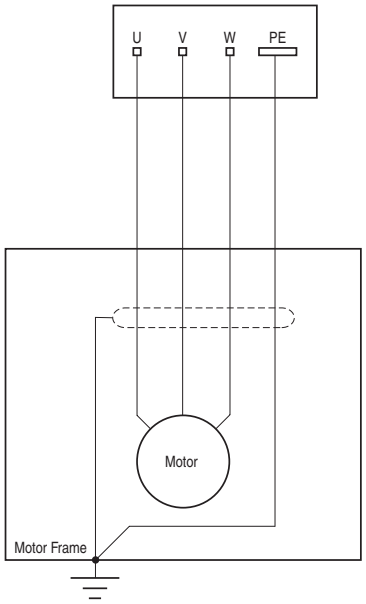
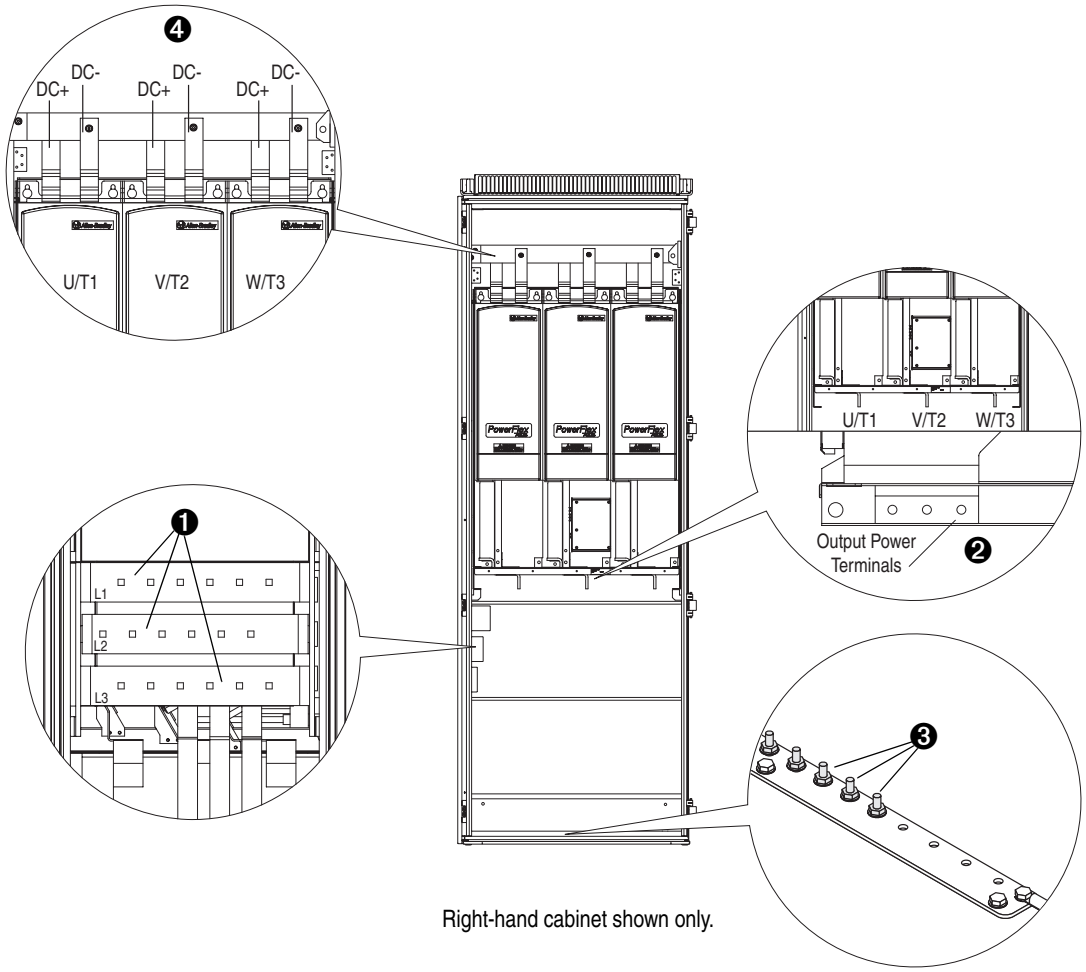


Table J Frame 13 Power Terminal Specifications

No.	Name	Description	Wire Size Range[1][2]		Torque	Terminal Bolt Size[3] [4]
			Maximum	Minimum	Recommended	
❶	Input Power Terminal Block L1, L2, L3[3]	Input power	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M12
❷	Output Power Terminal Block[3] U/T1, V/T2, W/T3	Motor connections	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M12
❸	SHLD Terminal, PE, Motor Ground[3]	Terminating point for wiring shields	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M10
❹	DC Bus[3] (3 Terminals; DC–, DC+)	DC input or external brake	300 mm^2 (600 MCM)	2.1 mm^2 (14 AWG)	40 N-m (354 lb.-in.)	M12

(1) Maximum/minimum sizes that the terminal block will accept - these are not recommendations.
(2) Do Not exceed maximum wire size. Parallel connections may be required.
(3) These connections are bus bar type terminations and require the use of lug type connectors.
(4) Apply counter torque to the nut on the other side of terminations when tightening or loosening the terminal bolt in order to avoid damage to the terminal.

Figure 16 Frame 13 Drive Terminal Locations



Right-hand cabinet shown only.

Step 8: Control Wiring

Wiring Recommendations

Important points to remember about I/O wiring:

- Always use tinned copper wire.
- Wire with an insulation rating of 600V or greater is recommended.
- Control and signal wires should be separated from power wires by at least 0.3 meters (1 foot).
- 4100CCF3 Flex I/O cable for use with DriveLogix is 3 ft. maximum length.

Important: I/O terminals labeled "(–)" or "Common" are not referenced to earth ground and are designed to greatly reduce common mode interference. Grounding these terminals can cause signal noise.

ATTENTION: Hazard of personal injury or equipment damage exists when using bipolar input sources. Noise and drift in sensitive input circuits can cause unpredictable changes in motor speed and direction. Use speed command parameters to help reduce input source sensitivity.

Note: If you are installing an ATEX approved drive and motor, refer to "ATEX Approved PowerFlex 700S Phase II Drives in Group II Category (2) Applications with ATEX Approved Motors" on page 70 for more information on control wiring.

Table K Recommended Control Wire

Type		Wire Type(s)	Description	Insulation Rating
Digital I/O	Un-shielded	Per US NEC or applicable national or local code	–	300V, 60° C (140° F), Minimum
	Shielded	Multi-conductor shielded cable such as Belden 8770 (or equiv.)	0.750 mm^2 (18 AWG), 3 conductor, shielded.	
Standard Analog I/O	Belden 8760/9460 (or equiv.)		0.750 mm^2 (18 AWG), twisted pair, 100% shield with drain (5).	300V, 75-90 °C (167-194 °F)
Remote Pot	Belden 8770 (or equiv.)		0.750 mm^2 (18 AWG), 3 cond., shielded	
Encoder/ Pulse I/O Less 30.5 m (100 ft.)	Combined:	Belden 9730 (or equivalent) (1)	0.196 mm^2 (24 AWG), individually shielded.	
Encoder/ Pulse I/O 30.5 m (100 ft.) to 152.4 m (500 ft.)	Signal:	Belden 9730/9728 (or equivalent) (1)	0.196 mm^2 (24 AWG), individually shielded.	
	Power:	Belden 8790 (2)	0.750 mm^2 (18 AWG)	
	Combined:	Belden 9892 (3)	0.330 mm^2 or 0.500 mm^2 (3)	
Encoder/ Pulse I/O 152.4 m (500 ft.) to 259.1 m (850 ft.)	Signal:	Belden 9730/9728 (or equivalent) (1)	0.196 mm^2 (24 AWG), individually shielded.	
	Power:	Belden 8790 (2)	0.750 mm^2 (18 AWG)	
	Combined:	Belden 9773/9774 (or equivalent) (4)	0.750 mm^2 (18 AWG), individually shielded pair.	

(1) Belden 9730 is 3 individually shielded pairs (2 channel plus power). If 3 channel is required, use Belden 9728 (or equivalent).
(2) Belden 8790 is 1 shielded pair.
(3) Belden 9892 is 3 individually shielded pairs (3 channel), 0.33 mm^2 (22 AWG) plus 1 shielded pair 0.5 mm^2 (20 AWG) for power.
(4) Belden 9773 is 3 individually shielded pairs (2 channel plus power). If 3 channel is required, use Belden 9774 (or equivalent).
(5) If the wires are short and contained within a cabinet which has no sensitive circuits, the use of shielded wire may not be necessary, but is always recommended.

DIP Switch Settings

ATTENTION: The DIP switches for Digital Inputs 4 - 6 are set to 24V DC at the factory. If you are running a 115V AC input application, the switches must be set as indicated below before applying power to the drive or damage to the Main Control board may occur.

Figure 17 Main Control Board Dip Switches

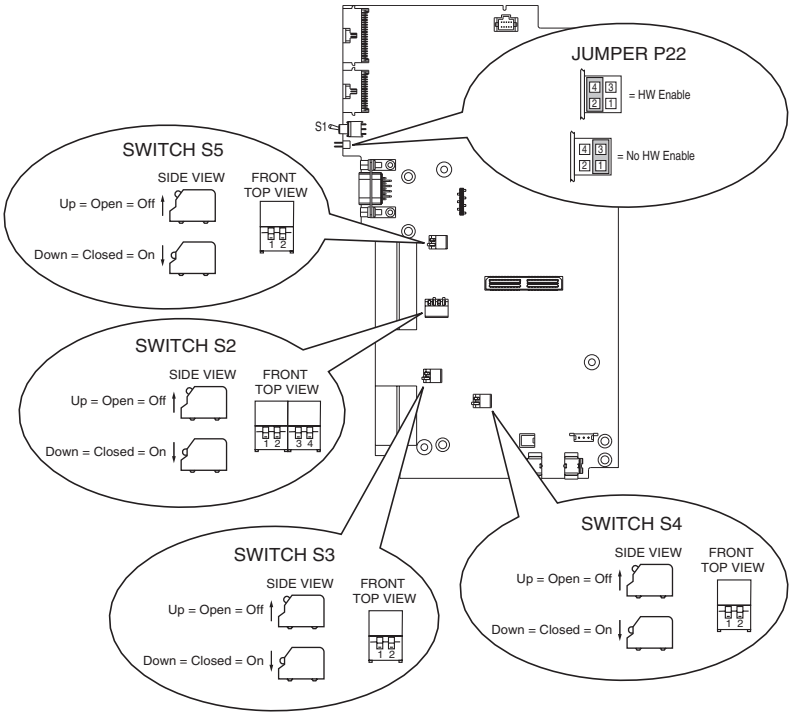


Table L Switch Settings

Function	Default	Switch	Open	Closed	Notes
Configuring Digital Input 6 for Hardware Enable (HW Enbl)	pin 2-4 HW Enbl	P22 Jumper	pin 2-4 HW Enbl	pin 1-3 No Enbl	No Jumper = HW Enbl
Analog Input 1	Voltage	S5-2	Voltage	Current	Change with Power Off
Analog Input 2	Voltage	S5-1	Voltage	Current	Change with Power Off
Digital Inputs 4-6 Voltage	24V DC	S4-1,2	115V AC	24V DC	Change with Power Off
Digital Input 1 Voltage	24V DC	S3-1	24V DC	12V DC	Change with Power Off
Digital Input 2 Voltage	24V DC	S3-2	24V DC	12V DC	Change with Power Off
Encoder Supply Voltage	12V DC	S2-4	12V DC	5V DC	Change with Power Off
Encoder Signal A Voltage	12V DC	S2-1	12V DC	5V DC	Set all switches the same
Encoder Signal B Voltage	12V DC	S2-2	12V DC	5V DC	
Encoder Signal Z Voltage	12V DC	S2-3	12V DC	5V DC	

Function	Down	Switch	Up	Center	Notes
DriveLogix Processor	Run	S1	Prog	Remote	Processor Mode

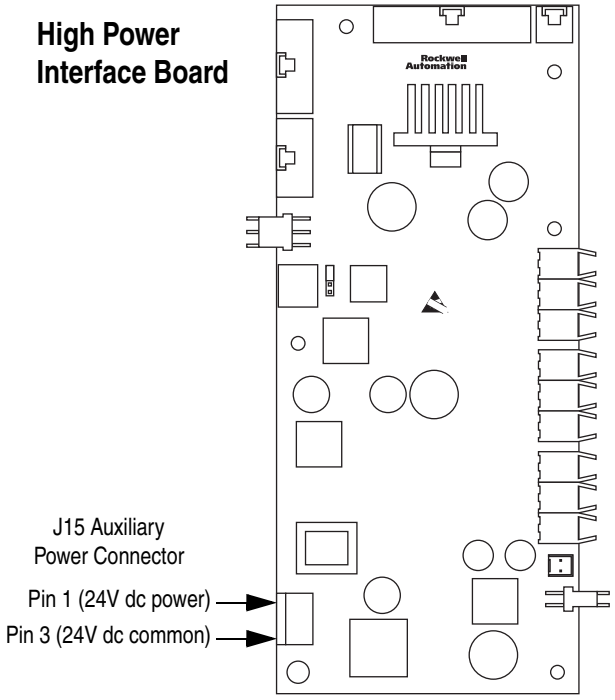
Please note there are two separate values for an encoder.

Auxiliary Power Supply

You may use an auxiliary power supply to keep the 700S Control Assembly energized when input power is de-energized. This allows the Main Control Board, DriveLogix controller and any feedback option cards to continue operation. Refer to the power wiring instructions for the appropriate frame size in "Step 7: Power Wiring" on page 34 for connection information. You must set Par 153 [Control Options], bit 17 “Aux Pwr Sply” to enable this feature.

Table M Auxiliary Power Supply Specifications

Voltage	Current (Min)	Power (Min)
24V DC ± 5%	3 A	75 W



I/O Terminal Blocks

Wiring the Main Control Board I/O Terminals

Terminal blocks TB1 and TB2 contain connection points for all inputs, outputs and standard encoder connections. Both terminal blocks reside on the Main Control Board.

Remove the terminal block plug from the socket, and make the connections.

Important: For NEMA 1 applications, all wiring must be routed through the conduit plate on the drive. Route any wires from the expanded cassette to the base cassette and out of the drive.

Reinstall the terminal block plug when wiring is complete. The terminal blocks have keys, which make it difficult to insert a terminal plug into the wrong socket.

Figure 18 Main Control Board I/O Terminal Locations

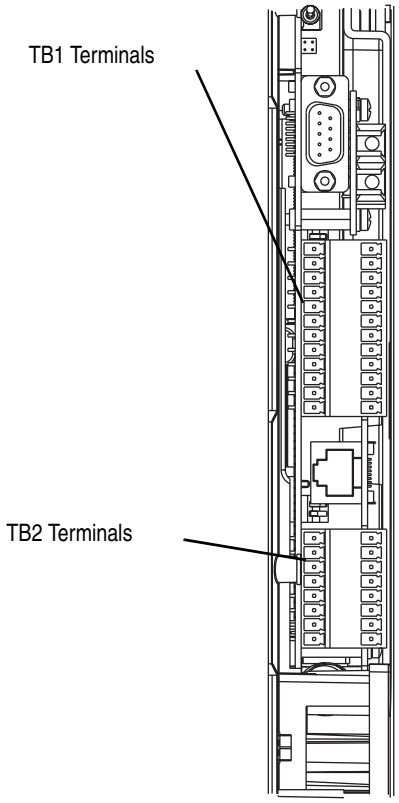
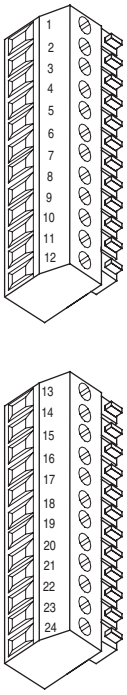


Table N Control & Encoder Terminal Block Specifications

		Wires Size Range (1)		Torque	
Name	**Description**	Maximum	Minimum	Maximum	Recommended
I/O & Encoder Blocks	Signal & Encoder power connections	1.5 mm^2 (16 AWG)	.14 mm^2 (28 AWG)	.25 N-m (2.2 lb.-in.)	.22 N-m (1.9 lb.-in.)

(1) Maximum/minimum sizes the terminal block will accept - these are not recommendations.

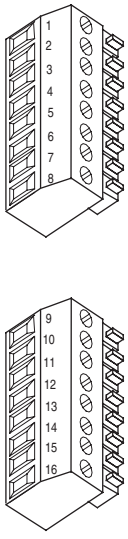
Table O TB1 Terminals



Terminal	Signal	Factory Default	Description
1	Analog Input 1 Comm.	(Volt)	Bipolar, differential input, +/-10V, 0-20 mA, 13 bit + sign 20k Ohm impedance at Volt; 500 Ohm impedance at mA(1)
2	Analog Input 1 (+/-)		
3	Shield	NA	Analog Input Shield
4	Analog Input 2 Comm.	(Volt)	Bipolar, differential input, +/-10V, 0-20 mA, 13 bit + sign 20k Ohm impedance at Volt; 500 Ohm impedance at mA
5	Analog Input 2 (+/-)		
6	Analog Input 3 [NTC-] Comm.	(Volt)	Differential input, 0-10V, 10 bit (for motor control mode FVC2, this is the temperature adaptation input).
7	Analog Input 3 [NTC+]		
8	Shield	NA	Analog Output Shield
9	Analog Output 1 (-)	(Volt)	Bipolar, differential output, +/-10V, 0-20 mA, 11 bit + sign 2k Ohm minimum load
10	Analog Output 1 (+)		
11	Analog Output 2 (-)	(Volt)	
12	Analog Output 2 (+)		
13	+10V Reference	NA	Rating: 20 mA maximum load (Recommend 5k Ohm pot)
14	Reference Common	NA	
15	-10V Reference	NA	
16	Encoder A	NA	Normal current draw per channel: 20 mA
17	Encoder A (Not)	NA	
18	Encoder B	NA	
19	Encoder B (Not)	NA	
20	Encoder Z	NA	
21	Encoder Z (Not)	NA	
22	Encoder Reference (+)	NA	12 or 5V DC power supply for primary encoder interface Rating: 300 mA maximum
23	Encoder Reference (-)	NA	
24	Encoder Shield	NA	Connection point for encoder shield

(1) The Analog inputs are not isolated. However, the analog inputs can be connected in series when using current mode. Note that at 20mA the voltage source must be capable of providing 10V dc at the drive terminals for one drive - - 20V dc is required for two drives and 30V dc is required for three drives, etc.

Table P TB2 Terminals

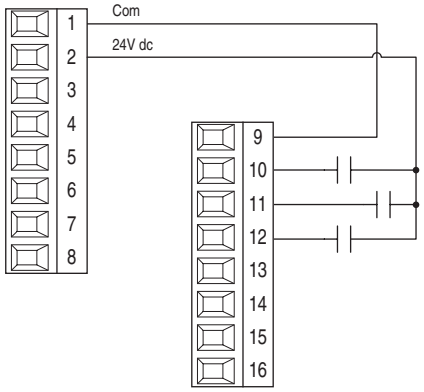
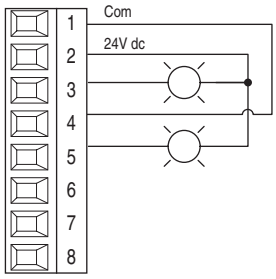
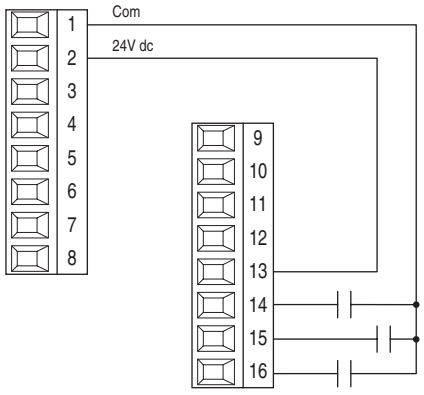
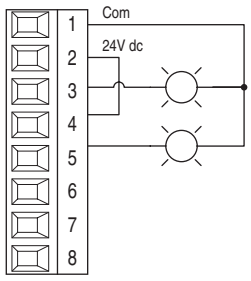


Terminal	Signal	Factory Default	Description
1	24V DC Common (-)	NA	Drive supplied 24V DC logic input power Rating: 300 mA maximum load
2	24V DC Source (+)	NA	
3	Digital Output 1		24V DC Open Collector (sinking logic) Rating: Internal Source = 150 mA max. External Source = 750 mA
4	Digital Output 1/2 Com	NA	Common for Digital Output 1 & 2
5	Digital Output 2		24V DC Open Collector (sinking logic) Rating: Internal Source = 150 mA max. External Source = 750 mA
6	Relay Output 3 (NC)		Relay contact output Rating: 115V AC or 24V DC = 2 A max. Inductive/Resistive
7	Relay Output 3 Com	NA	
8	Relay Output 3 (NO)		
9	Digital Input 1-3 Com	NA	Common for Digital Inputs 1-3
10	Digital Input 1		High speed 12-24V DC sourcing Digital Input Load:15 mA at 24V DC
11	Digital Input 2		
12	Digital Input 3		Load:15 mA at 24V DC sourcing
13	Digital Input 4-6 Com	NA	Common for Digital Inputs 4-6
14	Digital Input 4		Load: 10 mA at 24V DC sinking/sourcing Load: 7.5 mA at 115V AC **Note**: The 115 VAC Digital Inputs can withstand 2 milliamps of leakage current without turning on. If an output device has a leakage current greater than 2 milliamps a burden resistor is required. A 68.1K ohm resistor with a 0.5 watt rating should be used to keep the 115 VAC output below 2 milliamps.
15	Digital Input 5		
16	Digital Input 6	HW Enable	

I/O Wiring Examples

This section provides basic information to wire the PowerFlex 700S Drive.

Table Q TB2 Terminals — Digital Wiring Examples

Input/Output	Connection Example	Sourcing and Sinking Definitions
Digital Inputs used for enable and precharge control. *Note:* **24V DC Supply** - supports only on-board digital inputs. Do not use for circuits outside the drive. *Note*: The factory default for Digital Inputs is 24V. This must be switched in order to use 115V. Refer to "Switch Settings" on page 51 for switch settings. *Note*: Digital Inputs 1-3 are 12 - 24V DC.	Sourcing Digital Inputs - Internal Power Supply  Sourcing Digital Outputs - Internal Power Supply  Sinking Digital Inputs - Internal Power Supply  Sinking Digital Output - Internal Power Supply 	The digital inputs and digital outputs of the PowerFlex 700S AC drive support Sourcing or Sinking configuration. Typically, digital inputs are sourcing devices and digital outputs are sinking devices. The following definitions apply throughout this section: • **Sourcing a Digital Input** - The digital input common (return) is connected to the power supply common. Applying a positive voltage to the digital input will cause it to activate (pull up). • **Sinking a Digital Input** - The digital input common (return) is connected to the power supply positive voltage. Applying 0V or common to the digital input will cause it to activate (pull down). • **Sourcing a Digital Output** - The digital output common (return) is connected to the power supply common. The device to be controlled by the digital output is connect to the positive voltage and the device common is connected to the digital output. • **Sinking a Digital Output** - The digital output common (return) is connected to the power supply positive voltage. The digital output is connect to the device to be controlled and the device common is connected to the power supply common. *Note*: Digital Inputs 1-3 can only be configured as sourcing inputs. Digital Inputs 4-6 can be configured as sourcing or sinking inputs.

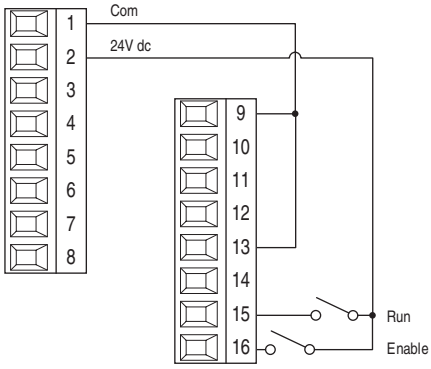
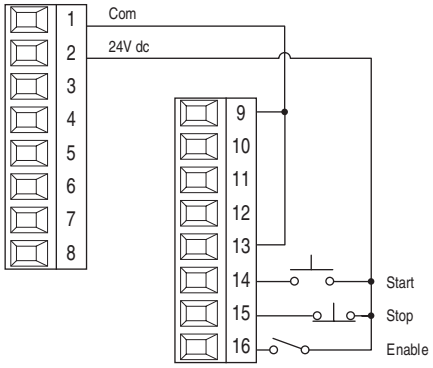
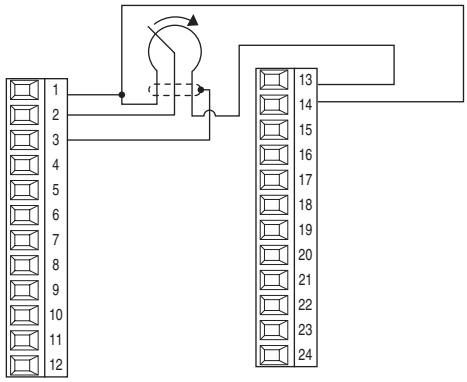
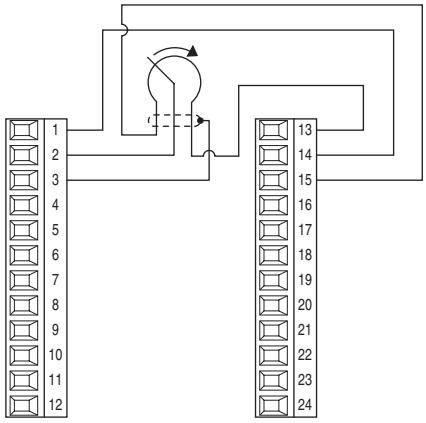
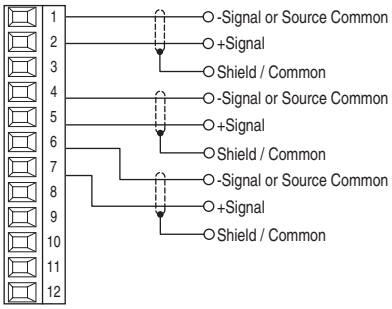
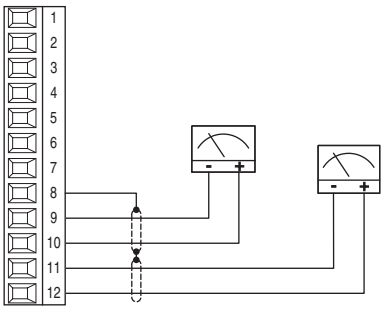
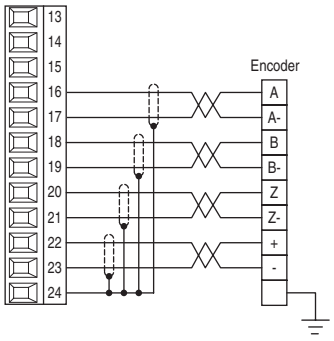
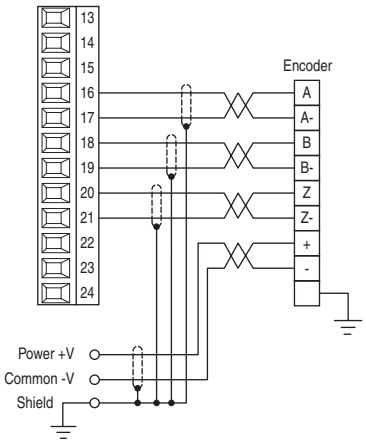
Input/Output	Connection Example	
Digital Inputs 24V DC	Sourcing Digital Inputs - Internal Power Supply, 2-Wire Control 	**Required Parameter Changes** • Set the value of Par 829 [Dig In5 Sel] to a value of 7 - "Run" • Par 153 [Control Options], bit 8 "3WireControl" will automatically be off (0) for 2-wire control. • Set Par 168 [Normal Stop Mode] for the desired stopping mode: 0 = Ramp Stop 1 = CurLim Stop 2 = Coast Stop
Digital Inputs 24V DC	Sourcing Digital Inputs- Internal Power Supply, 3-Wire 	• Set the value of Par 829 [Dig In5 Sel] to a value of 14 - "Normal Stop" • Set Par 828 [Dig In4 Sel] to a value of 5 - "Start" • Par 153 [Control Options], bit 8 "3WireControl" will automatically be off (0) for 2-wire control. • Set Par 168 [Normal Stop Mode] for the desired stopping mode: 0 = Ramp Stop 1 = CurLim Stop 2 = Coast Stop

Table R TB1 Terminals— Analog Wiring Examples

Input/Output	Connection Example	
0-10V Analog Input	0-10V Analog Input - Internal Source 	**Required Parameter Changes**

Input/Output	Connection Example	
0-10V Analog Input	0-10V Analog Input - Bi-Polar 	
0-10V Analog Input	0-10V Analog Input - External Source 	**Required Parameter Changes**
Analog Output +/-10V DC Used to drive analog meters displaying speed and current	0-10V Analog Output 	**Using Analog Out 1, -10V to + 10V to meter Motor RPM and direction:** • Send the data to the Analog Output Par 833 [Anlg Out1 Real] (the destination) linked to Par 71 [Filtered SpdFdbk] (the source) • Scale the Output to the source parameter Par 835 [Anlg Out1 Scale] = 175 (Par 4 [Motor NP RPM] = 1750 / 10V) **Using Analog Out 2, -10V to + 10V to meter Motor Current:** • Send the data to the Analog Output Par 840 [Anlg Out2 Real] (the destination) linked to Par 308 [Output Current] (the source) • Scale the Output to the source parameter Par 822 [Anlg Out2 Scale] = xx (Par 2 [Motor NP FLA] / 10 V Output)

Input/Output	Connection Example	
Primary Encoder Interface - Supports 12V DC differential encoders with internal power supply. 5V DC differential encoders require external power supply and special jumper settings. Used as primary closed loop speed feedback	Primary Encoder - Internal Supply 	**Using Encoder 0 as speed feedback:** • Par 222 [Motor Fdkbk Sel] = 0 - “Encoder 0” (default) • Par 232 [Encoder0 PPR] = Pulses/Rev for installed encoder
	Primary Encoder - External Supply 	

Step 9: Verifying the Start-up Check List

This section describes how to start-up your PowerFlex 700S Phase II drive.

ATTENTION: Power must be applied to the drive to perform the following start-up procedure. Some of the voltages present are at incoming line potential. To avoid electric shock hazard or damage to equipment, only qualified service personnel should perform the following procedure. Thoroughly read and understand the procedure before beginning. If an event does not occur while performing this procedure, **Do Not Proceed**. **Remove Power** including user supplied control voltages. User supplied voltages may exist even when main AC power is not applied to then drive. Correct the malfunction before continuing.

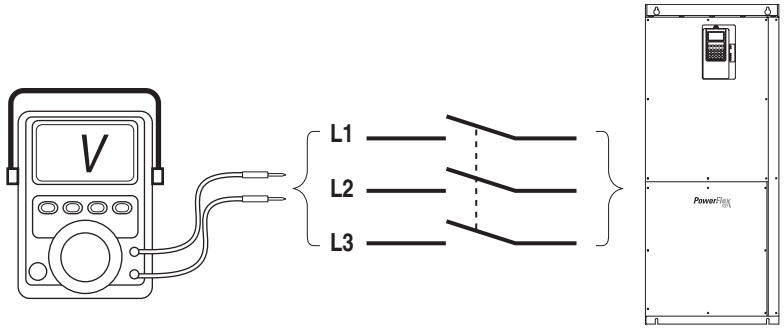
Important: If you have a DriveLogix application you must first connect the battery before starting this section.

Before Applying Power to the Drive

1. Confirm that motor wires are connected to the correct terminals and are secure.

   Note: Refer to "Power Terminal Specifications" for the appropriate drive frame size for motor connection information.

2. Confirm that encoder wires are connected to the correct terminals and are secure.
3. Confirm that all control inputs are connected to the correct terminals and are secure.
4. Verify that AC line power at the disconnect device is within the rated value of the drive.



The remainder of this procedure requires a Human Interface Module (HIM) be installed. If an operator interface is not available, remote devices should be used to start-up the drive.

Applying Power to the Drive

The RUN LED, controller LEDs, and SynchLink LEDs are only operational when the drive is energized. These LEDs are only visible when the drive door is open. The status of these LEDs can also be viewed from the HIM or from an application program (e.g., DriveExplorer™) in parameter 554 [LED Status]. This feature is only available with DriveLogix version 15.03 or later.

ATTENTION: The RUN LED and the controller LEDs are only operational when the drive is energized. Servicing energized equipment can be hazardous. Severe injury or death can result from electrical shock, burn or unintended actuation of controlled equipment. Follow Safety related practices of NFPA 70E, *ELECTRICAL SAFETY FOR EMPLOYEE WORKPLACES*. DO NOT work alone on energized equipment!

5. Apply AC power and control voltages to the drive. Examine the *Power (PWR)* LED.

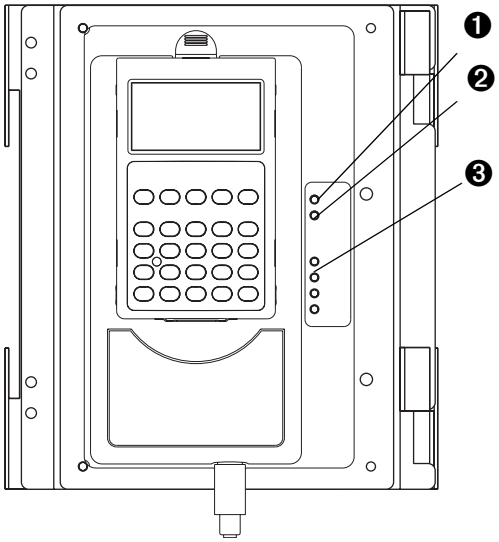


Table S Drive Status Indicator Descriptions

			#	Name	Color	State	Description
DRIVE	Power Structure		❶	PWR (Power)	Green	Steady	Illuminates when power is applied to the drive.
			❷	STS (Status)	Green	Flashing	Drive ready, but not running & no faults are present.
						Steady	Drive running, no faults are present.
					Yellow	Flashing	When running, a type 2 (non-configurable) alarm condition exists, drive continues to run. When stopped, a start inhibit exists and the drive cannot be started.
						Steady	A type 1 (user configurable) alarm condition exists, but drive continues to run.
					Red	Flashing	A fault has occurred.
						Steady	A non-resettable fault has occurred.
					Red / Yellow	Flashing Alternately	The drive is in flash recovery mode. The only operation permitted is flash upgrade.
	Control Assembly	Communications	❸	PORT	Refer to the *Communication Adapter User Manual*		Status of DPI port internal communications (if present).
				MOD			Status of communications module (when installed).
				NET A			Status of network (if connected).
				NET B			Status of secondary network (if connected).
		Control	(1)	SYNCHLINK	Green	Steady	The module is configured as the time keeper. or The module is configured as a follower and synchronization is complete.
					Green	Flashing	The follower(s) are not synchronized with the time keeper.
					Red	Flashing	The module is configured as a time master on SynchLink and has received time information from another time master on SynchLink.
				ENABLE	Green	On	The drive's enable input is high.
					Green	Off	The drive's enable input is low.

(1) SynchLink LEDS are located on the SynchLink daughtercard on the main circuit board in the control cassette.

6. Examine the *Status (STS)* LED. Verify that it is flashing green or that bit 1 "Sts Ready" of parameter 554 [LED Status] is set when viewed from the HIM or an application program. If it is not in this state, check the following possible causes and take the necessary corrective action.

Table T Common Causes of a Pre-Start Alarm

Examine Parameter 156 [Run Inhibit Status]			
Bit	**Description**		**Action**
1	No power is present at the Enable Terminal TB2- 16		Apply the enable
2, 3, 4	A stop command is being issued		Close all stop inputs
5	Power loss event is in progress, indicating a loss of the AC input voltage		Restore AC power
6	Data supplied by the power structure EEprom is invalid or corrupt		Cycle the power. If problem persists, replace the power structure.
7	Flash Update in Progress		Complete Flash Procedures
8	Drive is expecting a Start Edge and is receiving a continuous signal.		Open all start buttons and remove all start commands
9	Drive is expecting a Jog Edge and is receiving a continuous signal.		Open all jog buttons and remove all jog commands
10	A conflict exists between the Encoder PPR programming (Par 232 or 242) and the encoder configuration for edge counts (Par 233, bits 4 & 5).		Verify encoder data and reprogram
11	The drive cannot precharge because a precharge input is programmed and no signal is present.		Reprogram the input or close the precharge control contact.
12	Digital Configuration	Start input configured but stop not configured	Program Par 825-830 to include a stop button, rewire the drive
		Run input configured but control options do not match	Program Par 153, Bit 8 [3WireControl] to 0 (2-wire control)
		Start input configured but control options do not match	Program Par 153, Bit 8 [3WireControl] to 1 (3 wire control)
		Multiple inputs configured as Start or Run	Reprogram Par 825-830 so multiple starts, multiple runs or any combination do not exist
		Multiple inputs configured as Jog1	Reprogram Par 825-830 so only (1) is set to Jog1
		Multiple inputs configured as Jog2	Reprogram Par 825-830 so only (1) is set to Jog2
		Multiple inputs configured as Fwd/Rev	Reprogram Par 825-830 so only (1) is set to Fwd/Rev
14	Invalid Feedback Device for Permanent Magnet Motor Control		Set Par 222 to value 5 - “FB Opt Port0”

Table U Common Start-Up Faults

Fault	Description	Action
Encoder Loss	One of the following has occurred on an encoder: • missing encoder (broken wire) • quadrature error • phase loss	Reconnect encoder or replace encoder.
Motor Overload	A motor overload is pending.	Enter correct motor nameplate full load amps. *Par 2* [Motor NP FLA] or reduce excess load.
Motor Poles Fault	The poles of the motor do not match its rating.	Enter correct motor nameplate RPM. *Par 4* [Motor NP RPM]

If any digital input is configured to Stop - CF (CF=Clear Faults) verify the signal is present or the drive will not start. Refer to Chapter 4 in the *PowerFlex® 700S Drives with Phase II Control User Manual*, publication 20D-UM006…, for a list of potential digital input conflicts.

If a fault code appears, refer to "Fault & Alarm Clearing" on page 69 for more information.

At this point, The *Status (STS)* LED should be flashing green or bit 1 “Sts Ready” of parameter 554 [LED Status] should be set.

7. Install the Protective Covers and Control Frame (if applicable) in reverse order of removal as described in "Step 5: Removing Protective Covers" on page 24.

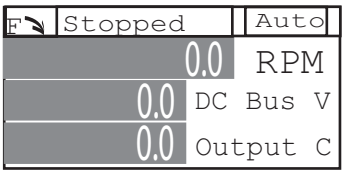
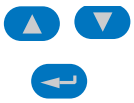
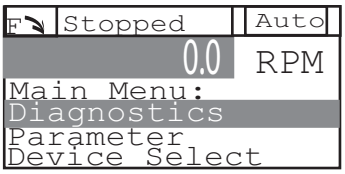
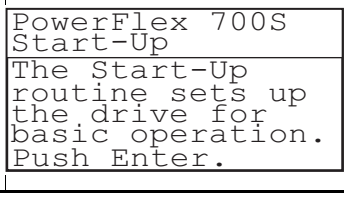
8. Proceed to "Step 10: Performing Assisted Start" on page 63.

Step 10: Performing Assisted Start

This routine prompts you for information that is needed to start-up a drive for most applications, such as line and motor data, commonly adjusted parameters and I/O.

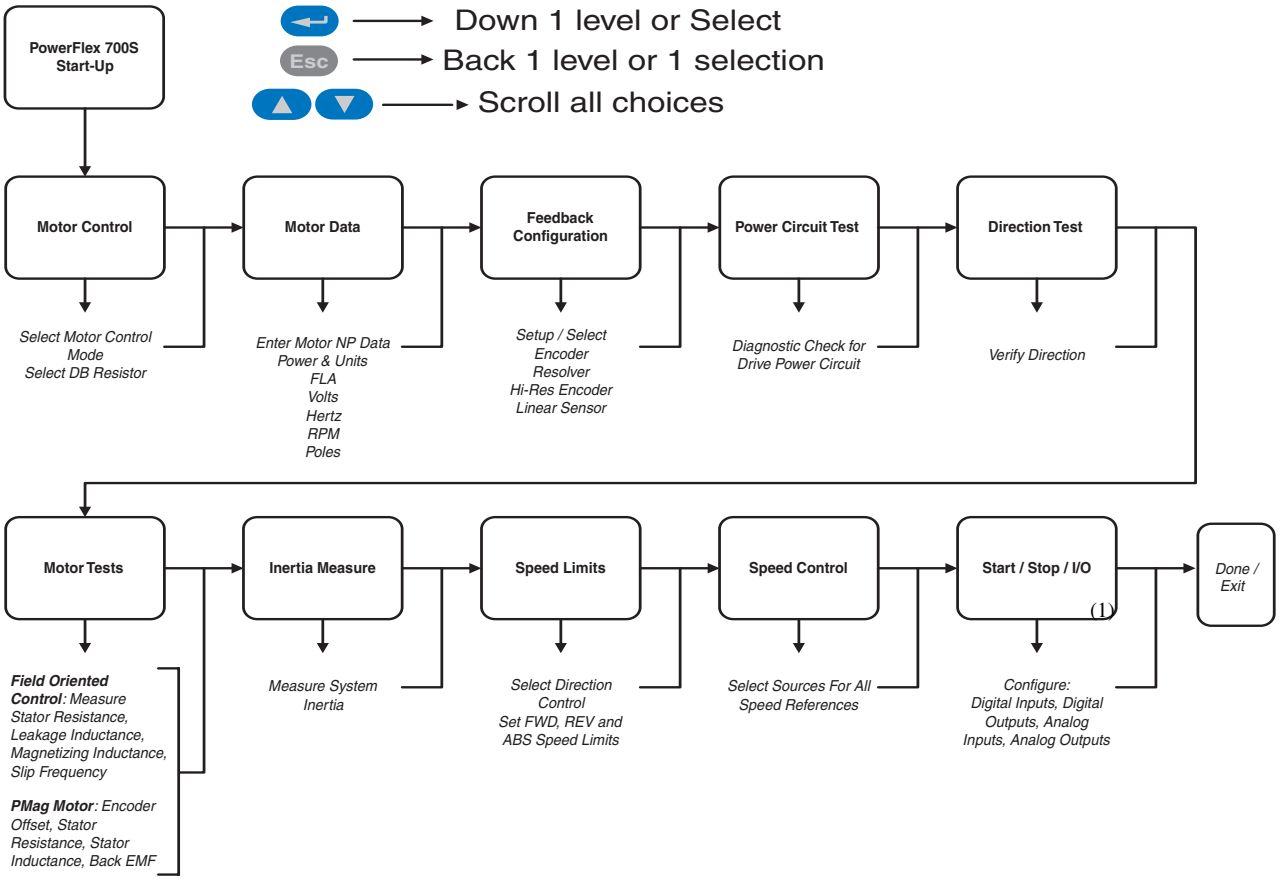
Important: This start-up routine requires a HIM. If the drive is configured for 2-wire control, the HIM installed on the drive will also act as a 2-wire device. In 2-wire mode, the drive will start when the HIM "Start" is pressed and stop when the HIM "Start" is released. The recommended mode of use for a Start-Up Routine is 3-wire control, Parameter 153 [Control Options], Bit 8 set to "1".

The assisted start-up routine asks simple yes or no questions and prompts you to input required information. Access Assisted Start-Up by selecting "Start-Up" from the Main Menu.

1. To exit the User Display screen Press Esc.		
1. In the Main Menu, use the Down Arrow to scroll to "Start Up". 2. Press Enter. **TIP:** Throughout the Start-Up Routine many screens have more selections than shown. Use the arrow keys to scroll through all the menu options.		
1. Follow the instructions on the screen to complete the Start-Up.		

TIP: If using a HIM the following functions are not available.

- Alt-Man
- Alt-Lang
- Alt-SMART



(1) See "Important" statement about the HIM on page 63

Step 11: Running Drive from HIM (Optional)

Follow these instructions to run the drive in a very basic fashion from the HIM. This step is very useful when commissioning a complex system.

Using the HIM, make the following parameter settings to allow the HIM to control the drive:

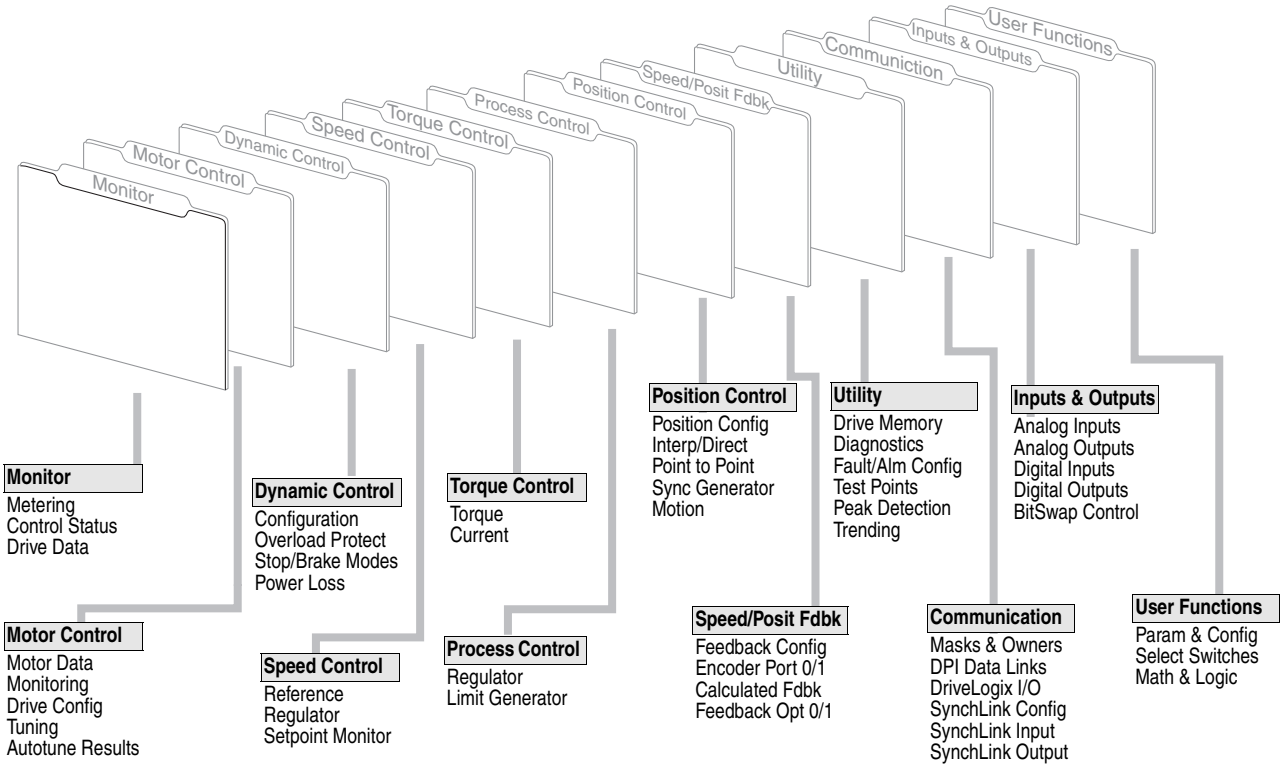
Set this parameter ...	... to this value
Parameter 16 [Speed Ref Sel]	0100 0000
Parameter 690 [Logic Mask]	0000 0000 0000 0010
Parameter 691 [DPI Ref Sel]	1 "Local HIM"
Parameter 694 [Start Mask]	0000 0000 0000 0010
Parameter 695 [Jog Mask]	0000 0000 0000 0010
Parameter 696 [Direction Mask]	0000 0000 0000 0010
Parameter 697 [Fault Clr Mask]	0000 0000 0000 0010
Parameter 22 [Motor Fdbk Sel]	2 "Sensorless"

Additional Information

This section contains additional information that may be helpful during drive start up, including:

- Frequently Used Parameters
- "Fault & Alarm Clearing" on page 69
- "HIM Indication" on page 69
- "Manually Clearing Faults" on page 69
- "ATEX Approved PowerFlex 700S Phase II Drives in Group II Category (2) Applications with ATEX Approved Motors" on page 70
- "Technical Support" on page 73
- "Drive Options" on page 74

Parameter Files & Groups



Frequently Used Parameters

Footnote definitions are found on page 68.

No.(1)	Name Description (2)	Values (3)		Linkable	Read-Write	Data Type
1	**Motor NP Volts** Set to the motor nameplate rated volts.	Units: Default: Min/Max:	Volt Calculated 75/705		RW	16-bit Integer
2	**Motor NP FLA** Set to the motor nameplate rated full load amps. Range limited by three-second inverter rating.	Units: Default: Min/Max:	Amps Calculated Calculated/Calculated		RW	Real

No.(1)	Name Description (2)	Values (3)	Linkable	Read-Write	Data Type
3	**Motor NP Hertz** Set to the motor nameplate rated frequency.	Units: Hz Default: Calculated Min/Max: 2.0000/500.0000		RW	Real
4	**Motor NP RPM** Set to the motor nameplate rated RPM.	Units: RPM Default: Calculated Min/Max: 1/30000		RW	16-bit Integer
5	**Motor NP Power** Set to the motor nameplate rated power.	Units: Hp Default: Calculated Min/Max: 0.2500/3500.0000		RW	Real
6	**Mtr NP Pwr Units** The power units shown on the motor nameplate.	Default: 0 Hp Options: 0 Hp 1 W			
10	**Speed Ref 1** Sets the speed reference that the drive should use when selected by Parameter 16 [Speed Ref Sel]. A value of 1.0 represents base speed of the motor.	Default: 0.0000 Min/Max: -/+2200000000.0000	✓	RW	Real
27	**Speed Ref A Sel** Selects the speed reference source for the drive. The selected speed ref values converge in the final selection of the drives speed reference with Par 152 [Applied LogicCmd] and are selected with bits 28,29,30. See the Block Diagrams in Appendix B of the *PowerFlex 700S with Phase II Control User Manual*, publication 20D-UM006…, for a description.	Default A: 1 "Spd Ref 1" Options: 0 "Zero Speed" 1 "Speed Ref 1" 2 "Speed Ref 2" 3 "Sum SRef 1+2" 4 "Reserved" 5 "Preset Spd 1" 6 "Preset Spd 2" 7 "Preset Spd 3 8 "Preset Spd 4" 9 "Preset Spd 5" 10 "Preset Spd 6" 11 "Preset Spd 7" 12 "DPI Port 1" 13 "DPI Port 2" 14 "DPI Port 3" 15 "Reserved" 16 "DPI Port 5"			
30	**Min Spd Ref Lim** Sets the minimum speed reference limit. This value may be negative or positive but not greater than parameter 31 [Max Spd Ref Lim].	Units: RPM Default: 0.00 Min/Max: -8.00/Par 31 [Max Spd Ref Lim] Scale: Par 41 [Motor NP RPM] = 1.0pu		RO	Real
31	**Max Spd Ref Lim** Sets the maximum speed reference limit. This value may be negative or positive but not less than parameter 30 [Min Spd Ref Lim].	Units: RPM Default: 0.00 Min/Max: Par 30 [Min Spd Ref Lim]/8.00 Scale: Par 41[Motor NP RPM] = 1.0pu		RO	Real
32	**Accel Time 1** Sets the rate of acceleration for all speed increases, with time in seconds to base speed. Accel Rate = Par 4 [Motor NP RPM] / Par 32 [Accel Time]	Units: Sec Default: 10.00 Min/Max: 0.010/6553.50 Type: Linkable Read-Write Real		RO	
33	**Decel Time 1** Sets the rate of deceleration for all speed decreases, with time in seconds to base speed. Decel Rate = Par 4 [Motor NP RPM] / Par 33 [Decel Time]	Units: Sec Default: 10.00 Min/Max: 0.010/6553.50	✓	RW	Real
34	**S Curve Time** Sets the S time (Round In and Round Out) in seconds. Half of the time specified is added to the beginning and half to the end of the applied ramp. The S time is independent of speed and results in a trapezoidal torque profile.	Units: Sec Default: 0.5 Min/Max: 0.0/4.0	✓	RW	Real
75	**Rev Speed Lim** Sets a limit on the speed reference in the negative direction. This value can be entered as a negative value or zero.	Units: RPM Default: -1.25 Min/Max: -8.00/0.00		RO	32-bit Integer
76	**Fwd Speed Lim** Sets a limit on the speed reference in the positive direction. This value can be entered as a positive value or zero.	Units: RPM Default: 1.25 Min/Max: 0.00/8.00		RO	Real
90	**Spd Reg BW** Sets the bandwidth of the speed regulator in rad/sec. Bandwidth is also referred to as the crossover frequency. Small signal time response is approximately 1/BW and is the time to reach 63% of set point. A change to this parameter will cause an automatic update of Parameters 81 [Spd Reg P Gain] and 82 [Spd Reg I Gain]. To disable the automatic gain calculation, set this parameter to a value of zero.	Units: R/S Default: 10.0000 Min/Max: 0.0000/500.0000 Comm Scale: x 1	✓	RW	Real

No.(1)	Name Description (2)	Values (3)	Linkable	Read-Write	Data Type
153	**Control Options** Set bits to configure the options for operating the drive.				

Options	Reserved	Sys Inrt En	Slip Test En	PM Offset En	Pwr Diag En	Trq Trim En	MC Atune En	Time Axis En	PITrim EnOut	Reserved	Inrt TrqLPEn	Motor OL Ret	Slip Comp	SpdRegPreset	Aux Pwr Sply	Auto Tach Sw	Reserved DM	Reserved DM	OL ClsLpDsbl	Jog -NoInteg	Iq Delay	Motor Dir	Reserved	3WireControl	Trq DsblZSpd	Trq StopRamp	Jog - NoRamp	Jog in Trq	Flying Start	SErrFilt1Stg	SRef LdLg En	Bipolar SRef	
Default	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0 = False
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	1 = True

222	**Mtr Fdbk Sel Pri** Enter a value to select the primary motor speed feedback device.	Default:	0	"Encoder 0"		
		Options:	0	"Encoder 0"	4	"Motor Sim"
			1	"Encoder 1"	5	"FB Opt Port0In"
			2	"Sensorless"	6	"FB Opt Port1"
			3	"Motor Fdbk"		
800	**Anlg In1 Data** Displays the scaled final value for Analog Input 1.	Default: Min/Max:	0.0000 -/+2200000000.0000			RO Real
801	**Anlg In1 Value** Displays the actual input value at Analog Input 1. Analog Input 1 may be configured for voltage or current input signal. For proper selection of the input signal, the DIP switch and Par 821 [Analog I/O Units] must be set to match.	Units: Default: Min/Max:	V/mA 0V/4 mA -/+20.0000			RO Real
802	**Anlg In1 Scale** Scales the range of Analog Input 1 to the range of Par 800 [Anlg In1 Data]. Enter the units you want per volt or mA. For example: If Par 801 [Anlg In1 Value] = 0 - 10V and you enter "6" in this parameter, Par 800 [Anlg In1 Data] will equal 0 - 60V. Par 801 * Par 802 = Par 800.	Units: Default: Min/Max:	/1v 0.0000 -/+2200000000.0000	✓		RW Real
803	**Anlg In1 Offset** Applies an offset to Analog Input 1. Use the offset to correct for zero signal errors or to create an offset to the actual input. The output of the A/D converter is summed with this parameter to produce Par 801 [Anlg In1 Value].	Units: Default: Min/Max:	Volt 0.0000 -/+20.0000	✓		RW Real
806	**Anlg In2 Data** Displays the scaled final value for Analog Input 2.	Default: Min/Max:	0.0000 -/+2200000000.0000			RO Real
807	**Anlg In2 Value** Displays the actual input value at Analog Input 2. Analog Input 2 may be configured for voltage or current input signal. For proper selection of the input signal, the DIP switch and Par 821 [Analog I/O Units] must be set to match.	Units: Default: Min/Max:	V/mA 0V/4 mA -/+20.0000			RO Real
808	**Anlg In2 Scale** Scales the range of Analog Input 2 to the range of Par 806 [Anlg In2 Data]. Enter the units you want per volt or mA. For example: If Par 807 [Anlg In2 Value] = 0 - 10V and you enter "6" in this parameter, Par 806 [Anlg In2 Data] will equal 0 - 60V. Par 807 * Par 808 = Par 806.	Units: Default: Min/Max:	/1v 0.0000 -/+2200000000.0000	✓		RW Real

Type of Input:	Configurable, Voltage or Current
Polarity:	Bi-Polar
Resolution:	14 bit (-8191 to +8191)

	DIP Switch	Analog I/O Units
AI 1 Voltage	S5-2 = Open	Par 821 Bit 0 = 0 (False)
AI 1 Current	S5-2 = Closed	Par 821 Bit 0 = 1 (True)

Type of Input:	Configurable, Voltage or Current
Polarity:	Bi-Polar
Resolution:	14 bit (-8191 to +8191)

	DIP Switch	Analog I/O Units
AI 2 Voltage	S5-1 = Open	Par 821 Bit 1 = 0 (False)
AI 2 Current	S5-1 = Closed	Par 821 Bit 1 = 1 (True)

No.(1)	Name Description (2)	Values (3)			Linkable	Read-Write	Data Type
825	**Dig In1 Sel** Enter a value to select the function of digital input 1. Selecting options 34 "UserGen Sel0" - 37 "UserGen Sel3" sends Binary Coded Decimal (BCD) data to Par 1022 [Sel Switch Ctrl] as follows: **Selection** / **Sends Input to this bit in Par 1022** 34 "UserGen Sel0" / Bit 1 "Sel Switch 00" 35 "UserGen Sel1" / Bit 2 "Sel Switch 01" 36 "UserGen Sel2" / Bit 3 "Sel Switch 02" 37 "UserGen Sel3" / Bit 4 "Sel Switch 03" Note: For all Stop Functions: Low = Stop, High = OK to Run, In "Norm Stop-CF" Low = Normal Stop and Clear Fault. Note: When Using the MAH instruction in DriveLogix to "home" an axis and Digital Input 1 is used as the homing switch, this parameter must be set to 0 "Not Used". When the MAH instruction is executed, this parameter will be changed to option 31 "Regis 1 Ltch", to indicate that the drive registration has latched the encoder position when the switch was activated. Note: Notes: Option 38 "ExtFault Inv" was added for firmware version 2.04. Option 39 "Home Switch" was added for firmware version 3.01.	Default: 0 = "Reserved" Options: 0 = "Reserved" 1 = "Enable" 2 = "Clear Faults" 3 = "Ext Fault" 4 = "Norm Stop-CF" 5 = "Start" 6 = "Reverse" 7 = "Run" 8 = "Reserved" 9 = "Reserved" 10 = "Jog 1" 11 = "Reserved" 12 = "Reserved" 13 = "Jog 2" 14 = "Normal Stop" 15 = "Spd Ref Sel0" 16 = "Spd Ref Sel1" 17 = "Spd Ref Sel2" 18 = "CurLim Stop" 19 = "Coast Stop" 20 = "Accel Decel2" 21 = "Indx Step" 22 = "Indx StepRev" 23 = "MOP Inc" 24 = "MOP Dec" 25 = "MOP Reset" 26 = "PI Trim En" 27 = "PI Trim Hold" 28 = "PI Trim Rst" 29 = "Trend Trig" 30 = "PreCharge En" 31 = "Regis 1 Ltch" 32 = "+Hrd OvrTrvl" 33 = "-Hrd OvrTrvl" 34 = "UserGen Sel0" 35 = "UserGen Sel1" 36 = "UserGen Sel2" 37 = "UserGen Sel3" 38 = "ExtFault Inv" 39 = "Home Switch"			
826	**Dig In2 Sel** Enter a value to select the function of digital input 2. Refer to Par 825 for a description of options 34 "UserGen Sel0" - 37 "UserGen Sel3". Note: For all Stop Function: Low = Stop, High = ok to Run, In "Norm Stop-CF" Low = Normal Stop and Clear Fault	Default: 0 = "Reserved" Options: 0 = "Reserved" 1 = "Enable" 2 = "Clear Faults" 3 = "Ext Fault" 4 = "Norm Stop-CF" 5 = "Start" 6 = "Reverse" 7 = "Run" 8 = "Reserved" 9 = "Reserved" 10 = "Jog 1" 11 = "Reserved" 12 = "Reserved" 13 = "Jog 2" 14 = "Normal Stop" 15 = "Spd Ref Sel0" 16 = "Spd Ref Sel1" 17 = "Spd Ref Sel2" 18 = "CurLim Stop" 19 = "Coast Stop" 20 = "Accel Decel2" 21 = "Indx Step" 22 = "Indx StepRev" 23 = "MOP Inc" 24 = "MOP Dec" 25 = "MOP Reset" 26 = "PI Trim En" 27 = "PI Trim Hold" 28 = "PI Trim Rst" 29 = "Trend Trig" 30 = "PreCharge En" 31 = "Regis 2 Ltch" 32 = "+Hrd OvrTrvl" 33 = "-Hrd OvrTrvl" 34 = "UserGen Sel0" 35 = "UserGen Sel1" 36 = "UserGen Sel2" 37 = "UserGen Sel3" 38 = "ExtFault Inv" 39 = "Home Switch"			
827 828 829 830	**Dig In3 Sel** Enter a value to select the function of digital input 3. **Dig In4 Sel** Enter a value to select the function of digital input 4. **Dig In5 Sel** Enter a value to select the function of digital input 5. **Dig In6 Sel** Enter a value to select the function of digital input 6. Refer to Par 827 for a description of options 34 "UserGen Sel0" - 37 "UserGen Sel3". Note: If used for HW Enable, digital input 6 is not available. Note: For all Stop Function: Low = Stop, High = ok to Run, In "Norm Stop-CF" Low = Normal Stop and Clear Fault	Default: 0 = "Reserved" Options: 0 = "Reserved" 1 = "Enable"(1) 2 = "Clear Faults" 3 = "Ext Fault" 4 = "Norm Stop-CF" 5 = "Start" 6 = "Reverse" 7 = "Run" 8 = "Reserved" 9 = "Reserved" 10 = "Jog 1" 11 = "Reserved" 12 = "Reserved" 13 = "Jog 2" 14 = "Normal Stop" 15 = "Spd Ref Sel0" 16 = "Spd Ref Sel1" 17 = "Spd Ref Sel2" 18 = "CurLim Stop" 19 = "Coast Stop" 20 = "Accel Decel2" 21 = "Indx Step" 22 = "Indx StepRev" 23 = "MOP Inc" 24 = "MOP Dec" 25 = "MOP Reset" 26 = "PI Trim En" 27 = "PI Trim Hold" 28 = "PI Trim Rst" 29 = "Trend Trig" 30 = "PreCharge En" 31 = "Reserved" 32 = "+Hrd OvrTrvl" 33 = "-Hrd OvrTrvl" 34 = "UserGen Sel0" 35 = "UserGen Sel1" 36 = "UserGen Sel2" 37 = "UserGen Sel3" 38 = "ExtFault Inv" 39 = "Home Switch"			

(1) No. = Parameter Number.

= parameter value cannot be changed until the drive is stopped.

(2) Name - Parameter name as it appears in DriveExecutive software.
Description - Brief description of parameter function.

(3) Values - Define the various operating characteristics of the parameter. There are 3 types of Values: ENUM, Bit and Numeric.

Fault & Alarm Clearing

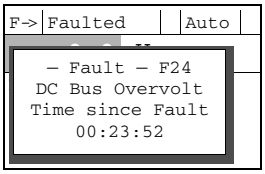
For a complete listing of Faults and Alarms, refer to the *PowerFlex® 700S Drives with Phase II Control User Manual*, publication 20D-UM006….

A fault is a condition that stops the drive. An alarm is a condition that, if left untreated, may stop the drive. There are three configuration types for indicating a fault and/or alarm.

Type	Fault Description	
①	Non-Configurable Fault	The cause of the fault must be corrected before the fault can be cleared.
②	User Configurable	Programming and commissioning personnel can configure the drive's response to these exception events. Responses include: • Ignore • Alarm • Fault Coast Stop • Fault Ramp Stop • Fault Current Limit Stop
③	Non-Configurable Alarm	Can only be configured as a alarm.

HIM Indication

The HIM also provides visual notification of a fault or alarm condition.

Condition	Display
Drive is indicating a fault. The LCD HIM immediately reports the fault condition by displaying the following: "Faulted" appears in the status line Fault number Fault name Time that has passed since fault occurred Press **Esc** to regain HIM control.	

Manually Clearing Faults

The following table contains the HIM keystrokes necessary to clear faults.

Step	Key(s)
1. Press **Esc** to acknowledge the fault. The fault information will be removed so that you can use the HIM.	
2. Address the condition that caused the fault. The cause must be corrected before the fault can be cleared.	
3. After corrective action has been taken, clear the fault by one of these methods. • Press **Stop** • Cycle drive power • Select **Clear Faults** from "Diagnostic - Faults" menu	

ATEX Approved PowerFlex 700S Phase II Drives in Group II Category (2) Applications with ATEX Approved Motors

General

This section provides information on the operation of an ATEX Approved drive and ATEX approved motor. The motor is located in a defined hazardous environment, while the drive is not. A protective system is required to stop current flow to the motor when an over temperature condition has been sensed in the motor. When sensed, the drive will go into a stop condition. To restart the drive, the over temperature condition must be resolved, followed by a valid start command to the drive. The PowerFlex 700S Phase II drive must have the DriveGuard® Safe-Off with Second Encoder option board installed for ATEX applications. Consult the *DriveGuard® Safe-Off Option for PowerFlex® 700S Phase II AC Drives and 700L Liquid-Cooled AC Drives User Manual*, publication 20D-UM007…, for installation instructions if necessary.

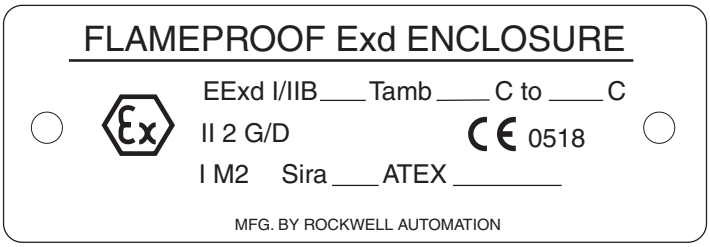
The drive is manufactured under the guidelines of the ATEX directive 94/9/EC. These Drives are in Group II Category (2) Applications with ATEX Approved Motors. Certification of the drive for the ATEX group and category on its nameplate requires installation, operation, and maintenance according to this document and to the requirements found in the User Manual and appropriate Motor Instruction Manual(s).

ATTENTION: Operation of this ATEX certified drive with an ATEX certified motor that is located in a hazardous environment requires additional installation, operation, and maintenance procedures beyond those stated in the standard user manual. Equipment damage and/or personal injury may result if all additional instructions in this document are not observed.

Motor Requirements

- The motor must be manufactured under the guidelines of the ATEX directive 94/9/EC. It must be installed, operated, and maintained per the motor manufacturer supplied instructions.
- Only motors with nameplates marked for use on an inverter power source, and labeled for specific hazardous areas, may be used in hazardous areas on inverter (variable frequency) power.
- When the motor is indicated for ATEX Group II Category 2 for use in gas environments (Category 2G) the motor must be of flameproof construction, EEx d (according to EN50018) or Ex d (according to EN60079-1 or IEC60079-1). Group II motors are marked with a temperature or a temperature code.
- When the motor is indicated for ATEX Group II Category 2 for use in dust environments (Category 2D) the motor must be protected by an enclosure (according to EN50281-1-1 or according to IEC61241-1: Ex tD). Group II motors are marked with a temperature.
- The motor over temperature signal supplied to the drive must be a normally closed contact (open during over temperature condition) compatible with the digital (logic) input circuitry of the drive. If multiple sensors are required in the motor, the connection at the drive must be the resultant of all required contacts wired in series.

- Refer to all product markings for additional cautions that may apply.
- Typical motor markings are contained on a motor certification nameplate similar to the sample below.

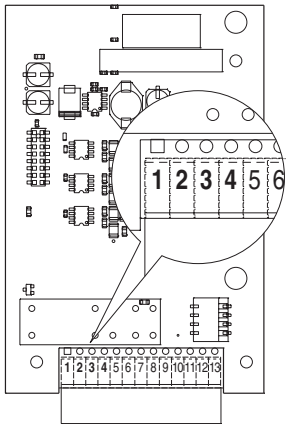


Drive Wiring

Important: ATEX certification of this drive requires that two separate inputs be configured to monitor a normally closed, over temperature contact (or multiple contacts wired in series) presented to the drive from the motor.

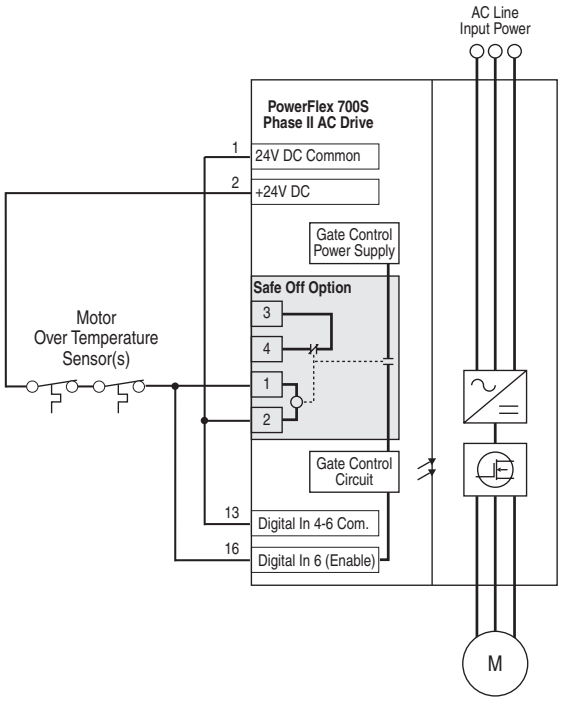
The first input must energize “Digital Input 6/Hardware Enable” on the drive control board (TB2, terminal 16). The second input must energize the relay coil on the DriveGuard® Safe-Off with Second Encoder option board (terminals 1 & 2 on the board). This option board must be installed in the drive for ATEX applications. It is offered with a 24V DC coil only. Both input signals are wired with respect to the drive's digital input common when using a control board with 24V I/O. Refer to "TB2 Terminals — Digital Wiring Examples" on page 55. Motor supplied contacts must have ratings compatible with the input circuit ratings and applied voltage level of the drive.

Safe-Off Terminal Descriptions



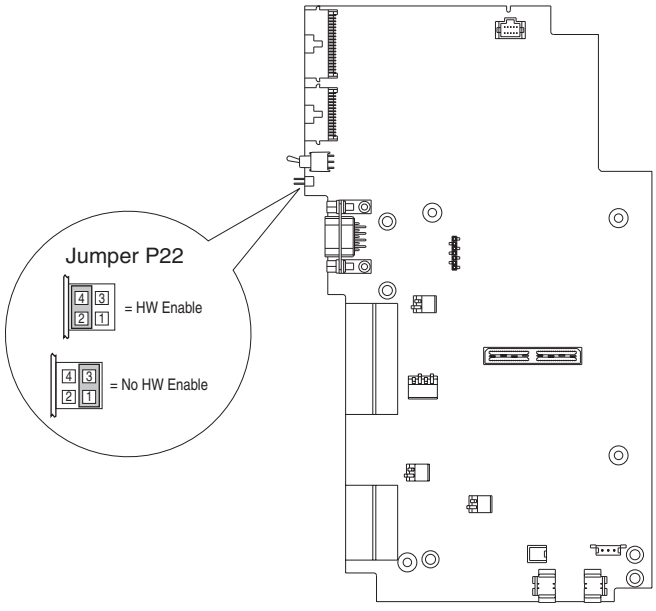
No.	Signal	Description
1	+24V DC	Connections for power to energize coil. 33.3 mA typical, 55 mA maximum.
2	24V Common	
3	Monitor - N.C.	Normally closed contacts for monitoring relay status. Maximum Resistive Load: 250V AC / 30V DC / 50 VA / 60 Watts Maximum Inductive Load: 250V AC / 30V DC / 25 VA / 30 Watts
4	Common - N.C.	

Wiring Example



Drive Hardware Configuration

Digital Input 6 must be configured as a Hardware Enable. Ensure that Jumper P22 on the Main Control Board is set to HW Enable (Pins 2 and 4).



Verify Operation

At regular intervals during the life of the machine check the protective system for proper operation. Both channels shall be verified using the table below. How frequently the protective system is checked is dependent on the safety analysis of the machine section controlled by the drive.

Protective System Status	Drive In Safe State	Drive In Safe State	Drive In Safe State	Drive Able To Run
Channel Operation				
Safe-Off Option Terminals 1 & 2	No Power Applied	Power Applied	No Power Applied	Power Applied
PowerFlex 700S Phase II Enable Input	No Power Applied	No Power Applied	Power Applied	Power Applied
Description For Verification				
Safe-Off Option Monitor Contact Terminals 3 & 4	Closed	Open	Closed	Open
PowerFlex 700S Phase II Drive Inhibits Param. 156, Bits 1 & 16	Bit 16 = 1 Bit 1 = 1	Bit 16 = 0 Bit 1 = 1	Bit 16 = 1 Bit 1 = 0	Bit 16 = 0 Bit 1 = 0

Technical Support

You can access the *PowerFlex® 700S - Phase II User Manual*, publication 20D-UM006… online at:

http://www.rockwellautomation.com/literature

PowerFlex 700S and DriveLogix™ Technical Support is available online by following these simple steps:

1. Open your Internet Browser, this may be: Microsoft® Internet Explorer, Netscape®, or Opera®.
2. With your browser open, type the following URL in your Address bar.

   http://www.ab.com/support/abdrives/powerflex700s/

3. Press the **Enter** key or click the **Go** button.

Drives Technical Forum

The *Drives Technical Forum* for all Allen-Bradley® drive products can help you solve issues in areas such as *Applications*, *Communications*, *Hardware* and *Software*. You can visit us at the following URL address...

http://www.ab.com/support/abdrives/registered.html

Telephone

Drives Technical Support Hotline

Monday through Friday, 7:00 a.m. to 7:00 p.m. Central Standard Time
Call **1-262-512-8176**

Drive Options

The table below contains a list of options for PowerFlex 700S drives with Phase II Control and the Allen-Bradley publications detailing these options.

These publications are available on the internet at: *www.rockwellautomation.com/literature*

Drive Option	Read this Document	Document Number
DriveLogix5730 Controllers used with PowerFlex 700S Phase II drives	User Manual - DriveLogix5730 Controller for PowerFlex 700S Drives with Phase II Control	20D-UM003…
Stegmann Feedback Option Card	Installation Instructions - Stegmann Feedback Option Card for PowerFlex 700S Drives	20D-IN001…
Resolver Feedback Option Card	Installation Instructions - Resolver Feedback Option Card for PowerFlex 700S Drives	20D-IN002…
Multi Device Interface Option Card	Installation Instructions - Multi Device Interface Option Card for PowerFlex 700S Drives	20D-IN004…
SynchLink Board for PowerFlex 700S Drives with Phase II Control	Installation Instructions - SynchLink Board for PowerFlex 700S Drives with Phase II Control	20D-IN010…
Second Encoder Option Card for Phase II	Installation Instructions - Second Encoder Option Card for Phase II	20D-IN009…
Embedded EtherNet/IP Option for 700S Phase II	Installation Instructions - Embedded EtherNet/IP Option for 700S Phase II	20D-IN011…
Embedded EtherNet/IP Option for DriveLogix5730	Installation Instructions - Embedded EtherNet/IP Option for DriveLogix5730	20D-IN012…
Logix Expansion Board for DriveLogix5730	Installation Instructions - Logix Expansion Board for DriveLogix5730	20D-IN013…
DriveGuard Safe-Off with Second Encoder for 700S Phase II	Installation Instructions - DriveGuard Safe-Off with Second Encoder for 700S Phase II	20D-IN016…
Heidenhain Feedback Option Card	Installation Instructions - Heidenhain Feedback Option Card for PowerFlex 700S Drives	20D-IN017…

Notes:

www.rockwellautomation.com

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